STYLE MANUAL PRESENT AND FUTURE

Discussion by Frank D. Smith, Assistant Chief
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Before the "Graduate Class,"
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In responding to the call to enter the "Sacrosanct portals of erudition" long enough to touch the high spots of the far-reaching and complex subject of "fundamental rules for printing as set forth in the Government Printing Office Style Manual," I wish to assure you that, in undertaking this highly important enterprise, I shall submit my views solely from the standpoint of a practical printer and not as a pedagogue.

This Manual, which is the result of years of endeavor to guide the inevitable change in language in the direction of greater uniformity by making analogy and logical principles the basis for decisions, has become a model of printing style procedure for all Government publications, and its decisions and principles are accepted as the standard by every branch of the service. While it is not 100 per cent perfect, its reasonable uniformity and conformity have been no small factor in reconciling the many conflicting opinions regarding consistant and logical rules for capitalization, compounding, tabulation, and text details.

Webster's New International Dictionary has been accepted as the authority in the spelling, compounding, and dividing of words. Now, we are all willing to concede that Webster is a good speller, and that he makes a reasonably accurate guess at the meaning of most words, but does that give him the right

to arbitrarily say that "shut-out" should be hyphenated, "shutdown" one word, and "shut up" two words? But such is the case.

In the matter of whims Webster is lavishly redundant, and that is what makes inconsistency so long-lived. "Antemundane" is one word, but you must make two words of "ante bellum," "battle ground" is set down as two words, "battleship" is one word, and "battle-axe" is hyphenated. "Courthouse" is a solid word, "court-martial" carries the hyphen, while we are told that "court room" should be classed as two words.

The "cowman" - one word - builds two pens. They are as like as two peas. He labels one "cowpen" - one word - he labels the other "bull pen" - two words. Why? Perhaps it is because "cow-puncher" is hyphenated. I also bow to Webster's dictum and make "summer time" two words and "wintertime" one, but I hesitate when asked to make one word of "sunglow," for when written as a solid word it is not always certain whether he refers to the rising sun or to crooning.

I could go on indefinitely citing instances where our beloved Webster has made two words grow where one grew before; he has removed the hyphen from compounds fondly joined and inserted a space in its stead, and he has taken that same hyphen and compounded words which many generations have been taught to regard as happily single.

But why this ceaseless discussion and difference of opinion over the rules to be followed in the use of what may be to the hasty reader an unimportant element in typography? Because written language is a visual medium by which the thought of a writer is conveyed to the reader, and if it conveys the same idea as the spoken word it must carry some substitute for inflection, pause, emphasis, and enunciation, without which oral communication would be

lifeless and often meaningless. The written word, however, is restricted to the cold and unyielding outlines of lifeless characters. To enliven and clarify the printed word it has been necessary to resort to capitalization, punctuation, and hyphenation. In certain classes of material the use of a hyphen is very important, because it restricts the word or words to a single meaning.

What is a compound? A compound consists of two or more words joined together with or without a hyphen. It is a distinct word used to express an idea differing in some degree from that expressed by its components used separately. A compound consists of words which have grown together through long association, or which express a unit idea. A compound word is hyphenated only to facilitate understanding or to avoid ambiguity. The hyphen serves to distinguish the components and thus obviates uncertainty as to meaning or pronunciation. "Ten one dollar bills" is unmistakable, but "twenty one dollar bills" leaves the reader wondering whether "21 dollar bills" or "20 1-dollar bills" is meant. According to the Style Manual this should be written "twenty 1-dollar bills." A hyphen between "long" and "rail" in the term "long rail haul" would create the impression that long rails were being hauled. The obvious meaning is that "long" is the adjective and "rail haul" is the nounal term. Hence, a hyphen is out of place. "Landing gear structure" without a hyphen might be construed as gear structure being landed from a boat. A hyphen between "landing" and "gear" makes the meaning unmistakable; and, of course you all know how terrible it would be to omit the hyphen between "wooden" and "shoe" when referring to a "wooden-shoe maker," but it would be a real tragedy to omit the hyphen between "common" and "school" when speaking of a "common-school teacher." However, compound adjectives generally take the hyphen (well-known orator), but the predicate adjective - the orator is well known - does not carry

the hyphen; nor is the hyphen used if the first word is an adverb ending in _ly_ - as "elegantly dressed gentleman." Fractions when spelled (one-eighth) should be hyphenated, but first class, second class, etc., carry the hyphen only when used in front of a noun - as, first-class dinner.

For further information with reference to hyphenation see list of word forms in general use on pages 166 to 200 of the Manual.

Because of the many conflicting opinions regarding compounding and the impossibility of drawing authorities into accord there has grown up an indefensible array of contradictory forms, a few of which I have previously cited. Time, however, may bring the acceptance of a simple and logical rule for compounding, but such acceptance seems remote so long as lexicographers and lexicologists regard individual preference as of greater importance than a simple and uniform style.

While the particular function of the Style Manual is to state clearly the more or less arbitrary decisions as to what procedure shall be followed, it is obviously impossible to give rules to cover every conceivable case, but by drawing a definite line of demarcation in the troublesome types of cases, it will be possible at least to attain a considerable degree of uniformity in Government publications.

Right here I wish to cite just one of the fundamental reasons for the adoption of this Manual as the standard of style for all Government printing. Having been an employee of that great printing establishment, and still acting as liaison officer between the Department of Agriculture and that office, I have had every opportunity to note the conditions surrounding the handling of manuscripts and other operations incident to the completion of the finished book or pamphlet. I am heartily convinced of the necessity for a standardized

system of printing procedure, not especially for the convenience of the printing office, but more to secure the utmost degree of economy in printing, and to make uniform the work performed for Government establishments as a whole.

It is, therefore, very essential that editors adhere closely to Style-Manual rules in order that "copy" may be submitted to the printer "prepared" as it will finally appear in the printed book. It should be remembered that the operation of transforming copy into type composition is somewhat similar to the building of a house. You are the architect, the printer is the builder, and Uncle Sam is the customer. Now, after the building (or composition) is completed, you decide to change the plans (or wording). In order to effect the change you have not only the cost of tearing down, but also the cost of rebuilding. During the process of rebuilding (author's alterations) there is the added danger of errors occurring. It is estimated that fully 60 per cent of the errors found in the finished work are the result of failure on the part of authors and copy editors to observe certain definite rules governing the preparation of manuscripts.

This gross abuse in printing is costing the Government upwards of $200,000 a year, and persistent efforts are being made to remedy this extravagant practice. In the Department of Agriculture alone, for the fiscal year ended June 30, 1931, author's alterations cost considerably over $15,000. When you consider the fact that this amount of money will print 2,260,000 sixteen-page Farmers' Bulletins, which includes the cost of material, composition, illustrations, presswork, binding operations, and delivery, you can see the needless waste in unnecessary alterations.

Obviously the submission of incomplete, illegible, and improperly prepared manuscripts, and the return of improperly marked proofs to the printer

not only increase the cost of the finished printed product to the department, but seriously delay work at the printing office.

CAPITALIZATION

Under this head I shall endeavor to submit a few principal underlying rules for capitalization: Proper nouns and proper adjectives are capitalized, and common nouns and common adjectives are not, but the difficulty in applying this rule lies in the fact that some nouns and adjectives are construed as proper in certain connections, and common in others. Johnson House (hotel) caps; but Johnson house (residence) lower-case; Statue of Liberty - caps; but the statue when standing alone is not capitalized.

Proper nouns and derivatives of proper names, where used with a proper meaning, are always capitalized. Example, capitalize Rome (Roman), Louis Pasteur; but roman (type) and pasteurization (germ-destroying process) being used with an acquired and independent common meaning, are not capitalized. (See Manual for exceptions).

A common noun or a common adjective forming an essential part of a proper name is capitalized - Massachusetts Avenue, Union Station, Cook County, but lower case the avenue, the station, the county. However, a common noun used alone as a widely recognized short form of a specific proper noun is capitalized - the Capitol, the Monument (the Washington Monument at Washington) the Canal (Panama Canal) and the Avenue when referring to Pennsylvania Avenue in Washington. Capitalize plural form of a common noun - Fourteenth and F Streets, State and War Departments. An epithet used with or for a proper name is capitalized - the Keystone State, the Panhandle (railroad) the Hub (Boston). Capitalize the full, the shortened, and the popular names of governmental bodies, and of organizations, institutions, and organized

assemblages - League of Nations, the League; United States Congress, the Congress. Capitalize all titles immediately preceding the names of persons (Chief of Bureau W. A. Taylor; W. A. Taylor, Chief, Bureau of Plant Industry); but W. A. Taylor, chief of bureau - "chief" and "bureau" are not capitalized. Titles after signatures, however, are capitalized. (For examples of lower-casing under this category see page 14 of the Manual.) Capitalize principal words in titles of books, plays, poems, etc., and quote if introduced by the use of the word "entitled." Religious terms - Heavenly Father, Bible, Scriptures, Gospel, Christian, and all words denoting the Diety (except who, whose, and whom) are capitalized; also capitalize scientific names (Agnostis Conadensis), geologic terms (Carboniferous), and trade names (Bon Ami); but class terms (durum wheat) are lower cased. Capitalize names of historic events, historic epochs, holidays, and ecclesiastical feast and fast days - Battle of Bunker Hill, World War, Fourth of July, Feast of the Passover, etc. (A general guide to capitalization will be found on pages 22 and 28 of the Manual).

ITALIC

Italic letters stand out prominently in a page of roman type, and therefore are commonly used for words and phrases which for any purpose are to be differentiated from the rest of the text. However, as an undue amount of italic actually defeats its purpose, its use in general work is restricted. It is not to be used for casual emphasis or for foreign words unless it is specially requested and the copy is so edited.

The names of vessels and aircraft and the scientific names of species are italicized; also names of genera when followed by names of species; but phyla, classes, orders, families, and tribes when standing alone are printed in roman. Someone else will have to define these higher groups, as my knowledge

is limited to the genus Homo. Avoid the use of italic for display and quote words in text printed in other type which would be italicized in text printed in roman type.

ABBREVIATIONS

There is not much to be said concerning abbreviations. The rules given in the Manual cover practically all classes of abbreviations used in Government publications. However, when for good reason, departures are made from this list, or where unusual abbreviations are used, the printer should be instructed to "follow copy." Abbreviate States and Territories after city, town, county, military camp, national park, cape, island, mountain, river, etc., or any other geographic term when the name is given - Denver, Colo.; Fort Riley, Kans.; Mono National Forest, Calif. For clock time, if immediately connected with figures, use a.m., p.m., and m. (lower-cased); for compass directions use E. and W., caps, for east and west, but in compound terms close up, as, NE. and SW. for northeast and southwest. Express temperature in figures and use degree mark (78° F.). Use lat. for latitude and long. for longitude when with figures. Use the ampersand, or as the printers say, "short and" (&) in firm names (Jones & Brown), but spell out in literary, artistic, scientific, and similar companionships - as, an article by Smith and Reynolds.

Civil, military, and naval titles should be spelled in full, except when followed by initials or Christian name (Lieutenant Colonel Brown; but Lieut. Col. J. E. Brown), also abbreviate United States if preceding the name of a Government vessel - U.S.S. Kentucky, but any other designation than "ship" or "steamer" should be spelled, as, U. S. Monitor Nantucket.

FIGURES

Rules covering the use of figures and when to spell are treated in detail in the Manual, but some of us get confused at times, and it is indeed a bewildering subject. All isolated amounts under 10 should be spelled - we know that - but what appears to be isolated to some, others do not consider isolated. All figures in a group are written as figures, and three items constitute a group - 2 men, 3 women, 1 child; take away the one child and the other two would spell.

The rule is that all units of measure will go in figures - 1 inch, 5 grams, 9 miles, 1 kilometer. Isolated fractions will spell even though they are units of measure - one-half inch; but 4½ inches is in figures. Units of time, other than age and clock time, should be spelled out if under 10 - he worked nine hours; he waited one year; but a child 9 years old began work at 9 a. m. Nine is a figure. Qualifying numbers such as "eighteen" in the expression "eighteen 7-inch guns" are spelled out to avoid confusion.

And now a last word concerning the Style Manual. The first essential of Government editing is knowledge of the principles and rules laid down in the Manual. You must be familiar with the first 52 pages and the last section, that on compound and noncompound words. You will then recognize things that may be questioned by the printer. In other words, while the copy is still in the hands of the editor, proofreader's queries should be anticipated. Where there is the least doubt concerning the printer's interpretation, indicate on the copy what is wanted and give an example.

Modern roman has been adopted as the standard type face for use in publications of the United States Government, although consideration is sometimes

given the author who wishes to employ other recognized book-type faces when the publication is of a special character. In ordinary bookwork the following sizes of type are used: For text, 10 point; for extracts, quotations, bibliographies, and similar matter, somewhat smaller type (8 point); for tabular matter, topical indexes, and footnotes, still smaller type (6 point). All these should be indicated when marking copy for the printer. Signs and symbols should be plainly marked; also dashes, superior and inferior letters and figures. Number footnote references consecutively from 1 to 99, but footnotes for tables are separately numbered, those for each table beginning with 1. Always submit clean legible copy.

Of course you know that this Manual is undergoing a complete revision, and the committee appointed by the Public Printer is now busily engaged in the work and perhaps will be for another six months, and it may be another six months before the Manual will be adopted. I am going to tell you just a few things about the committee, as well as give you an idea or two concerning its methods of procedure.

This committee was appointed about two years ago, and the personnel consists of six carefully selected men from the Government Printing Office; namely, H. B. Barnhart, superintendent of printing; W. A. Mitchell, superintendent of planning; M. A. Bullock, chief of the proof section; F. W. Kihlbon, chief reviser, proof section; E. A. Huse, assistant production manager; and H. B. Goodrell, assistant chief of the proof section. Six persons likewise were selected to represent the departments: Henry B. Hubbard, scientist and chief editor, Bureau of Standards; Alice M. Ball, historian and chief editor, State Department; B. H. Lane, chief editor, Geological Survey; W. P. True, scientific editor, Smithsonian Institution; Martin A. Roberts, chief editor, Library of Congress, and Frank D. Smith, assistant chief of publications, Department of Agriculture.

This committee has been meeting at least once, and quite frequently twice, a week. It has had a strenuous job, for it has tried to work out simple, consistent modes of procedure constructed in accordance with the rules of grammar but modified somewhat by such fully established usage as does not follow these rules. To reconcile these has, indeed, been an extremely perplexing job. But it is believed that the principles finally decided upon come close to actually prevailing good usage and that increasing familiarity with these principles will appreciably reduce the time spent in consulting dictionaries and lists of exceptions.

The rules governing capitalization are grouped in such a way as to make the procedure unquestionable, and the capitalization of any word not given in the list of examples may easily be arrived at by analogy. Lower-cased forms are given only when needed to make clear the limits of the rules for capitalization. Capitalize such terms as the following unless exceptions are noted.

Inherited names - Jones; given names - Charles; nicknames - Chick; or accepted appelations - Peter the Hermit.

Unique names of works of man - the Sphinx; or of nature - Mammoth Cave.

Names of calendar divisions -- months, June; days of the week, Friday; holidays - Labor Day; historic periods - the Renaissance.

Astronomical terms - Milky Way (the Galaxy); countries - France; geographic regions - the Tropics; cities - Trenton; counties - Montgomery; towns - Rockville; and unique geographic features - Great Falls.

Recognized proper names of official bodies - World Court; names of sects - Seventh-Day Adventists; names of organizations - American Legion; names of institutions - National Museum; names of corporations - Pennsylvania Railroad Co.; scientific categories - Chordata; but names of species are not capitalized.

Titles of officials of high rank or station - General, Prince of Wales; titles used with a name - Governor Smith; titles used in place of a name - The

President; titles of unique works of art - Mona Lisa; titles of publications - Decline of the West.

Terms for deity or for religious concepts - Redeemer; ceremonial terms and names of officials of secret orders - Supreme Potentate.

The foregoing simple rules are sufficient to give you an idea of how easily they may be applied.

The rules for hypenation are also fairly simple. Of course there are exceptions, but it is doubtful whether any acceptable set of rules could be devised that would not have some exceptions, but those suggested by the committee are few and cover clearly defined small classes of words. I shall cite just a few of them.

Two nouns used together to indicate one thing form a compound unless the first noun is used in an adjective sense. A compound noun is hyphenated if each of two words has more than one syllable; if either of the words has only one syllable the hyphen is omitted -- lamplighter, dewdrop, are solid words, but cabinet-maker is hyphenated as each of these last words has more than one syllable.

A compound unit of quantity is hyphenated regardless of the number of syllables -- ton-mile, second-feet, kilowatt-hour, foot-pound.

Two words used together to indicate something other than would be implied by the literal sense of the word form a solid word -- blackbird, badlands. If the first word is in the possessive form a hyphen is used - bull's-eye, mare's-nest; a hyphen is used to avoid doubling a vowel or tripling a consonant -- horse-eye, cross-stitch; an adjective and a noun used together do not form a compound word unless they indicate something other than would be implied by the literal sense--blue sky, two words; but bluefish, one word.

Prefixes, such as anti, pseudo, semi, pre, and post, are not followed by a

hyphen except before a capital, to avoid doubling a letter, to separate two vowels that would form a diphthong, or to avoid changing the meaning -- superfine, one word; but pan-American, post-temporal, tri-iodide, antero-interior, re-treat (to treat again).

I trust that I have given sufficient information to convince you that the committee has made considerable advancement toward solving the problem of compounding. There will inevitably be unsettled questions, but the principles adopted seem logical. Nonessentials may be disregarded and left to the editor's choice as we leave to the author the choice of words.

This brings me to the stopping place, but before reaching the "all" mark permit me to remind you that, even in this machine-minded age, we should not forget the debt that civilization owes to printing.

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Editing Technical Material

Edit (on the copy) the material given below. Put it in suitable form for publication in the Journal of Agricultural Research. Remember that this article is written for specialists in the field treated. Arrange the material in logical order, and insert appropriate headings and subheadings. Delete any material that may be irrevelant. Correct any statements or conclusions that are shown by the context to be erroneous. The list of literature cited has purposely been omitted.

STUDIES AND FEEDING EXPERIMENTS ON THE VITAMIN CONTENT OF HONEY

Honey has been considered a valuable food since times began. Consisting as it does of a mixture of dextrose and levulose it is easily eaten and digested, and this fact may account in part for the good results obtained when it is used in the diet, especially of growing infants. Since honey can be used to advantage in the human diet of infants, children, and adults, the question arose as to whether it might not be a source of some or all of the vitamins found in foods of all kinds. A review of the literature revealed the fact that very little work had been done in the way of determining quantitatively the vitamin content of honeys and honeycombs.

Since it was out of the question to make an exhaustive examination of honeys of all the principal floral sources, and the flowers from all the honey-growing regions of the world, three samples representing the extremes of color variation were chosen for investigation and study. None of the honeys had been heated as is often the case with extracted honey. Honey No. 1 was a white-clover honey from Grover Hill, Ohio. This was in a granular state when received. Honey 2 was a buckwheat honey, very dark in color, produced near Varysburg, N. Y. Honey No. 3 was a light-colored white-clover honey from Middlebury, Vt. It was drained from the comb and the comb was pressed as free from adhering honey as possible and was also used in feeding tests.

The method used for vitamin A determinations was essentially that of Sherman and Munsell with a few modifications.

The basal diet consisted of casein (purified), 18 per cent; starch, 67 per cent; brewery yeast, 10 per cent; Osborne and Mendel salts, 4 per cent; table salt, 1 per cent. The diet was irradiated with the light from a mercury vapor quartz lamp tp insure an abundance of vitamin D. The rats were fed the vitamin-A-free diet until stationary or declining weight and appearance of symptoms due to vitamin A deficiency indicated that their body stores of vitamin A were depleted. As soon as the rats were in a suitable condition to be used for tests they were weighed and placed in individual cages. A weighed amount of the vitamin-A-free food was given to each rat and the honey was fed as a daily supplement to this diet.

Honey 1 and No. 2 were fed daily in amounts of 1, 2, and 3 gm. per day. The plan of feeding daily portions of honey to the rats required a great deal of time. For this reason honey No. 3 and the honeycomb were incorporated in the basal diet in place of 30 per cent of the starch. In each litter one or more animals were designated as controls and received only the basal diet during the test period.

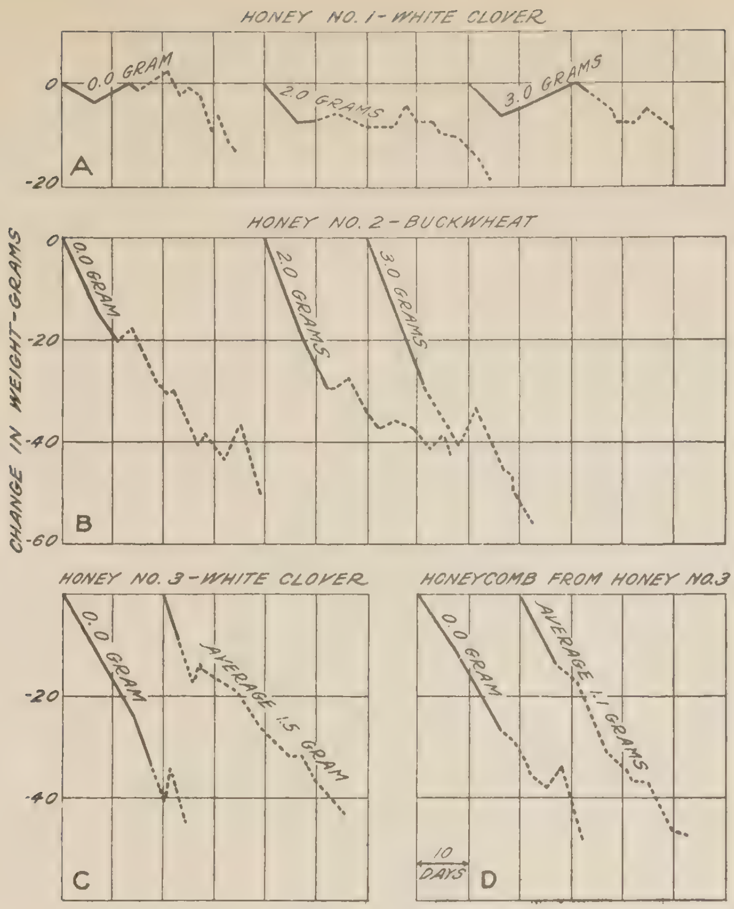

Figure 1. Changes in weight made during the test period by groups of rats fed honey or honeycomb as the sole source of vitamin A. Each curve is the average result of several tests. The amount of honey or honeycomb received by each rat six times per week is indicated on each curve.

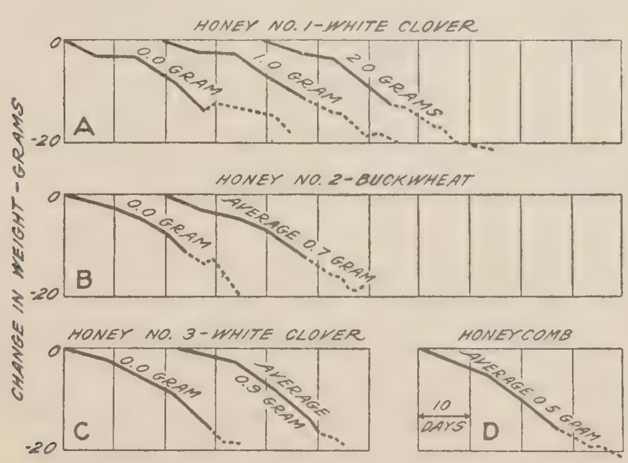

Figure 2. Curves showing changes in weight made during the test period by groups of rats fed honeycomb as the sole source of vitamin B. Each curve is the average result of several tests. The amount of honey or honeycomb fed to each rat six times per week is indicated on each curve. The change in weight for the group is represented by a solid line to the point where the death of the first animal occurred. The broken line represents the averages for the surviving animals until all had died.

The test period was continued for eight weeks, or until it was officially terminated by the lamentable death of the rat. If the rat did not live out the eight weeks the last recorded weight is that of the deceased rat. Autopsies were performed on all animals to determine whether the gross pathological lesions shown by animals confined to a vitamin-A-free diet were present. Table 1 gives the wights and survival periods of the rats used for these tests and also records the pathological lesions found. Curves showing the changes in weight made by averaging results from the groups of test animals are presented in Figure 1, A and C.

Few of the rats receiving the honey or honeycomb lived out the full eight weeks of the test period, though they lived on a weighted average longer than the control rats. The average period of survival of the rats fed no honey was 77.7, 60.9, and 66.0 days respectively. The average period of survival of the rats fed 2 gm. of honey per rat per day, six days per week was 77.4 days in the case of white-clover honey No. 1, 60.9 days in the case of light-colored white-clover honey No. 2, 65.2 days in the case of buckwheat honey No. 2, and 64 days when the honeycomb itself was fed. When white-clover honey No. 1 and buckwheat honey No. 2 were fed in larger quantities, or to the extent of 3 gm. per rat per day, six days in the week, the average survival period of the animals proved to be greater not only than that of the control animals but also of those fed only 2 gm. of honey per rat per day. While the feeding of light-colored white-clover honey No. 2 increased the survival period of the test animals this was not the case when the honeycomb was fed. In all cases the rats fed honey and honeycomb exhibited as severe pathological lesions as those that received no honey in addition to the basal diet.

These results indicate that one of these three samples of honey contained an amount of vitamin A that could be detected by the method used for measuring this factor.

The determination of the vitamin B content of the three samples of honey was completed before the multiple nature of vitamin B had been generally recognized. The method used was that of Sherman and Spohn, which makes no distinction between the two vitamin B factors. All rats were kept in cages having raised screen bottoms and were given a basal diet of casein (purified) 18 per cent, starch 68 per cent, butterfat 8 per cent, cod liver oil 2 per cent, Osborne and Mendel salts 4 per cent. Honey No. 1 was fed in amounts of 1, 2, and 3 gm. per rat per day. The other two samples were incorporated in the basal diet and replaced 30 per cent of starch; the honeycomb replaced 20 per cent. The test period is usually eight weeks, but all of the animals used for these tests died before the end of the eighth week. The results are shown in Figure 2 and Table 3.

Only one of the honey samples and the honeycomb enabled the rats to live any longer or to make any greater gains in weight than the rats that received no additions to the basal diet. These results show that the honeys and honeycomb examined contained no vitamin B. This, of course, does not take into consideration the fact that vitamin B was subsequently found to be a complex.

The method for testing for vitamin D is identical with that described in a previous paper. Young rats approximately 60 grams in weight were placed on the Steenbock low phosphorus diet consisting of yellow corn, 76 per cent; wheat gluten,

Table 1.--Weight records of rats fed honey and honeycomb as the sole source of vitamins A and C

WHITE-CLOVER HONEY (NO. 1)

Quantity of honey fed per rat per day, 6 days per week (grams)	Rat No.	Weight of rats at age of 4 weeks	Weight of rats	Successive weeks of test period: 1	2	3	4	5	6	7	8	Period of survival
		Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams
	907	54	67	65	68	74	67	52	---	---	---	91
	922	50	65	62	63	71	54	50	---	---	---	84
	923	48	58	52	60	56	59	42	---	---	---	87
	937	51	66	64	68	78	77	54	---	---	---	84
0-------	968	61	80	83	98	86	71	---	---	---	---	74
	975	54	71	68	88	85	77	60	---	---	---	83
	993	59	88	92	85	84	77	66	---	---	---	79
	996	52	77	70	74	70	66	50	---	---	---	79
	1110	36	80	69	56	53	---	---	---	---	---	57
	1123	45	85	78	75	76	58	---	---	---	---	59
Average --	----	---	---	---	---	---	---	---	---	---	---	77.7
	908	53	70	64	63	70	64	54	---	---	---	91
	921	46	55	53	51	57	53	45	---	---	---	91
	935	58	79	71	75	83	77	69	---	---	---	82
	972	56	61	53	49	---	---	---	---	---	---	59
2.0------	974	54	70	67	82	83	79	66	55	51	---	93
	994	57	83	77	77	60	61	57	---	---	---	79
	1107	64	116	95	95	75	---	---	---	---	---	63
	1120	45	92	84	80	79	60	---	---	---	---	61
Average --	----	---	---	---	---	---	---	---	---	---	---	77.4
	924	44	52	45	50	49	45	---	---	---	---	77
	925	42	50	45	48	52	44	36	---	---	---	84
	933	62	76	64	67	86	92	82	67	---	---	89
3.0-----	934	52	66	58	60	67	62	49	---	---	---	84
	971	57	67	62	81	84	70	59	---	---	---	81
	995	55	86	84	77	76	60	58	---	---	---	78
	1119	46	95	88	83	78	77	71	---	---	---	67
Average→	----	---	---	---	---	---	---	---	---	---	---	80.0

BUCKWHEAT HONEY (NO. 2)

	1366	55	134	123	109	84	---	---	---	---	---	55
	1373	48	111	91	91	68	68	---	---	---	---	56
	1391	55	130	110	105	104	88	75	---	---	---	70
0---------	1396	52	120	96	98	96	65	---	---	---	---	65
	1404	57	136	125	127	112	109	100	85	---	---	74
	1405	58	124	113	121	105	77	---	---	---	---	63
	1415	59	139	123	100	---	---	---	---	---	---	48
	1420	54	111	109	95	73	---	---	---	---	---	56
Average-	----	---	---	---	---	---	---	---	---	---	---	60.9
	1368	50	126	109	103	81	69	---	---	---	---	59
	1372	53	117	102	90	82	74	74	---	---	---	66
	1390	59	147	120	93	88	---	---	---	---	---	54
2.0--------	1393	55	115	103	95	94	98	76	72	---	---	74
	1403	61	157	125	115	95	94	---	---	---	---	57
	1407	56	118	97	109	100	82	67	---	---	---	67
	1417	52	119	104	80	---	---	---	---	---	---	49
Total --	----	---	---	---	---	---	---	---	---	---	---	60.9
	1365	56	139	125	92	90	---	---	---	---	---	42
	1371	54	120	97	83	95	72	68	---	---	---	63
	1389	59	137	126	95	81	---	---	---	---	---	49
3.0--------	1392	49	126	94	99	94	80	68	---	---	---	69
	1402	63	153	135	107	89	---	---	---	---	---	54
	1406	57	126	96	103	90	77	---	---	---	---	62
	1414	61	132	121	111	91	---	---	---	---	---	58
	1418	51	123	106	81	---	---	---	---	---	---	48
Average-	----	---	---	---	---	---	---	---	---	---	---	55.6

Table 1.--Continued

LIGHT-COLORED WHITE-CLOVER HONEY (NO. 3)

0--------	2908	58	114	102	93	80	---	---	---	---	---	65
	3086	57	131	108	95	79	---	---	---	---	---	65
	3089	52	114	105	93	80	69	---	---	---	---	69
	3092	49	110	105	92	70	---	---	---	---	---	65
Average -	-----	---	---	---	---	---	---	---	---	---	---	66.0
Average, 1.5 (30 per cent of diet)	2903	63	137	101	---	---	---	---	---	---	---	54
	2904	62	120	113	109	89						67
	2906	57	134	94	---	---	---	---	----	---	---	54
	2907	58	98	87	---	---	---	---	---	---	---	51
	2909	55	118	109	96	94	76	---	---	---	---	76
	2910	54	115	85	95	85	84	72	---	---	---	83
	2911	50	106	82	---	---	---	---	---	---	---	54
	3085	57	125	118	98	94	80	---	---	---	---	70
	3087	50	104	87	84	---	---	---	---	---	---	53
	3088	56	123	105	108	90	92	---	---	---	---	72
	3090	51	105	95	90	78	76	64	---	---	---	76
	3091	50	117	100	87	80	---	---	---	---	---	66
	3093	40	100	94	91	83	63	---	---	---	---	72
Average--	----	---	---	---	---	---	---	---	---	---	---	65.2

HONEYCOMB

0---------	3128	58	114	107	107	83	72	---	---	---	---	65
	3129	57	117	110	83	74	---	---	---	---	---	62
	3131	54	112	100	94	86	88	69	---	---	---	74
	3141	70	153	144	132	116	97	---	---	---	---	68
	3142	64	136	128	119	101	100	83	---	---	---	75
	3145	57	111	105	102	75	65	---	---	---	---	66
	3444	59	145	126	97	90	---	---	---	---	---	58
	3445	57	124	101	90	84	---	---	---	---	---	60
	3448	52	110	105	89	85	69	---	---	---	---	70
	3450	44	102	94	84	67	66	---	---	---	----	64
Average -	----	---	---	---	---	---	---	---	---	---	---	66.2
Average, 1.1 (20 per cent of diet)----	3125	61	134	112	100	86	84	---	---	---	---	64
	3127	59	122	110	107	86	72	---	---	---	---	70
	3130	56	114	105	92	78	74	---	---	---	---	67
	3132	47	106	96	82	63	---	---	---	---	---	59
	3144	60	130	119	96	95	84	76	---	---	---	73
	3143	54	111	107	94	74	---	---	---	---	---	62
	3146	57	117	110	92	---	85	70	---	---	---	76
	3446	55	120	80	---	---	---	---	---	---	---	49
	3447	52	114	95	86	---	---	---	---	---	---	53
	3449	52	103	100	85	79	65	---	---	---	---	67
Average -	----	---	---	---	---	---	---	---	---	---	---	64.0

Table 2.—Weight records of guinea-pigs fed honeycomb as the sole source of vitamin B

Quantity of honey fed per rat per day, 6 days per week (grams)	Rat No.	Weight of rats at age of 4 weeks	1	2	3	4	5	6	7	8	Period of survival
WHITE-CLOVER HONEY (NO. 1)											
		Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Days
	988	46	38	37	34	25	---	---	---	---	28
0-------------	1142	44	40	40	37	37	34	29	26	---	45
	1304	50	51	49	44	39	33	---	---	---	35
	1308	50	50	52	45	35	33	---	---	---	30
Average-----	----	---	---	---	---	---	---	---	---	---	34.5
	985	51	49	46	39	32	---	---	---	---	28
	987	48	46	45	37	30	---	---	---	---	28
	1137	47	41	44	41	38	33	30	27	---	46
1.0------------	1143	37	32	35	31	28	25	24	---	---	36
	1305	45	49	41	37	30	28	---	---	---	34
	1307	48	46	50	47	37	34	---	---	---	35
	1397	51	52	51	45	40	36	31	---	---	42
	1400	50	45	47	42	37	33	28	---	---	40
Average-----	----	---	---	---	---	---	---	---	---	---	36.1
	986	45	44	45	37	30	---	---	---	---	25
	989	44	41	39	33	27	---	---	---	---	28
	1138	47	41	40	37	34	30	26	25	---	46
2.0	1139	42	37	35	33	29	25	23	---	---	36
	1303	50	51	48	40	39	32	---	---	---	35
	1306	50	54	48	41	35	30	---	---	---	34
	1399	49	44	46	40	36	32	30	---	---	36
	1401	50	47	47	40	35	31	28	---	---	37
Average-----	----	---	---	---	---	---	---	---	---	---	34.6
BUCKWHEAT HONEY (NO. 2)											
	1961	45	41	41	36	30	26	---	---	---	34
	1963	41	40	36	31	25	---	---	---	---	26
0-----------	1972	41	39	37	33	27	---	---	---	---	28
	1985	35	34	31	27	25	---	---	---	---	24
	1989	32	32	29	26	21	19	---	---	---	30
Average-----	----	---	---	---	---	---	---	---	---	---	28.4
	1962	44	41	42	38	33	27	26	---	---	38
	1963	42	41	38	35	31	25	---	---	---	34
	1964	48	45	44	41	35	29	27	---	---	38
	1965	46	41	37	35	31	28	28	---	---	39
	1966	45	40	39	35	30	26	---	---	---	33
	1967	42	40	38	35	27	25	---	---	---	31
	1969	32	30	28	27	23	20	---	---	---	35
	1970	44	39	37	33	25	22	---	---	---	32
Average, 0.7 (30 per cent of diet)	1971	44	41	39	35	29	24	24	---	---	36
	1973	41	38	36	33	29	25	25	---	---	36
	1974	39	38	34	31	26	22	---	---	---	33
	1984	35	30	31	27	23	21	---	---	---	30
	1986	34	33	34	30	25	21	---	---	---	30
	1987	33	30	30	27	21	---	---	---	---	28
	1988	32	32	30	28	24	23	---	---	---	32
	1990	37	35	32	29	28	23	---	---	---	35
	1991	35	31	31	27	23	21	---	---	---	31
	1992	34	31	32	29	24	21	---	---	---	30
Total-----	----	---	---	---	---	---	---	---	---	---	33.4
LIGHT COLORED WHITE-CLOVER HONEY (NO. 3)											
	3010	49	49	45	41	34	30	---	---	---	31
	3014	45	46	43	38	32	27	---	---	---	31
	3015	45	45	42	36	31	29	---	---	---	30
0----------	3072	52	50	48	40	36	32	---	---	---	32
	3075	52	48	44	43	38	33	28	---	---	38
	3079	45	41	38	38	30	29	---	---	---	29
	3081	45	41	37	36	30	26	---	---	---	31
Average---	----	---	---	---	---	---	---	---	---	---	31.7
	3009	50	52	49	44	38	33	---	---	---	31
	3011	48	50	49	41	34	33	---	---	---	30
	3012	47	47	45	40	33	30	---	---	---	30
	3013	49	50	47	42	35	31	---	---	---	30
Average, 0.9 (30 per cent of diet).	3016	45	47	44	40	32	30	---	---	---	30
	3071	55	56	51	46	39	36	---	---	---	35
	3073	52	52	50	44	38	35	---	---	---	31
	3074	53	49	49	43	35	32	---	---	---	30
	3077	48	46	44	42	38	33	---	---	---	31
	3078	48	43	42	38	33	29	---	---	---	31
	3080	45	40	39	34	31	27	---	---	---	31
Total ----	----	---	---	---	---	---	---	---	---	---	30.9
HONEYCOMB											
	3173	50	48	45	39	34	31	29	---	---	40
	3174	50	48	45	38	33	29	---	---	---	34
	3175	47	43	42	35	32	28	---	---	---	34
Average, 0.5 (20 per cent of diet)	3176	45	44	41	36	30	28	---	---	---	33
	3177	48	45	42	35	31	28	---	---	---	33
	3178	47	45	41	34	31	---	---	---	---	27
	3179	46	44	39	34	31	---	---	---	---	28
Average---	----	---	---	---	---	---	---	---	---	---	32.7

20 per cent; calcium carbonate, 3 per cent; and sodium chloride, 1 per cent, for 21 days, at which time they showed evidences of a rachitic condition. The honey was then fed during a test period of not less than 6 nor more than 15 days. At the end of the test period a line test was made according to the method described by McCollum. While this method may not be entirely satisfactory for quantitatively measuring vitamin D it seemed to us to be preferable to any other method worked out to date.

The three honeys tested were incorporated in the basal diet to the amount of 30 per cent, 10 per cent, and 20 per cent, respectively, and the honeycomb as 10 per cent. In each litter of rats used for testing honey No. 1 there was one or more control rats which were given 0.5 per cent cod-liver oil during the test period instead of honey. This plan of having positive controls was not considered necessary in the tests with the other samples.

Summaries of the results of these tests are given in Tables 4 and 5. As all of the line tests with the honeys and the honeycomb were negative, the results with individual rats are not given. X-ray photographs were also made of the rats used in these determinations. These pictures check the line tests made on the corresponding rats in that all showed severe rickets. From these results it would seem that none of the honeys examined nor the honeycomb contained any amount of vitamin D that would cause calciumndeposition in rats which had been maintained for 21 days on the Steenbock low-phosphorus-yellow-corn diet.

Dutcher determined the vitamin B content of honey obtained while basswood and white clover were in full bloom, using pigeons in his work. The tests were made by absorbing the vitamin of the honey on Lloyd's reagent and feeding amounts equivalent to 45 gm. of honey. Nectar was tested in the same manner. Dutcher concluded that the strained honey contained a negligible amount of vitamin B and that there was little evidence of its presence in nectar.

In 1919 Bachman found that 25 c. c. of a strained honey added to 75 c. c. of water and used in Nagel's solution did not furnish the vitamin necessary for the growth of yeast.

Faber in 1920 made a study of the antiscorbutic value of a white-sage comb honey which was extracted before using. Guinea pigs used, and all of them eshibited characteristic scurvey symptoms when fed a solution of 1 part of honey to 15 parts of water, which was later increased to 1 part of honey to 5 parts of water. The quantity of honey consumed ranged from 0.88 to 5.58 c. c. of ~~of~~ honey per 100 gm. of initial body weight. Faber concluded that it was "probable" that honey contained no antiscorbutic vitamin.

Hawk, Smith, and Bergeim determined the vitamin A, B, and C content of blended honey, white-clover honey, and honeycomb. For vitamin B their method consisted in feeding three groups of rats, respectively, (1) a diet free from vitamin B; (2) one in which blended honey replaced part of the starch; and (3) one in which white-clover honey replaced part of the starch. At the end of four weeks the diets were changed. Group 1 was divided and half the rats were given blended honey and the other half white-clover honey. After another two weeks allwere given milk. From the results obtained, Hawk and his associates concluded that there was a small amount of vitamin B present in these honeys. Following a similar procedure for the vitamin A determination, they found that strained honey contained no vitamin A, whereas a definite but minimal amount was present in the comb honey. For the vitamin C test they fed three groups of guinea pigs in the same way; that is, they gave one group the scorbutic diet, a second group the same diet with blended honey to replace a part of the starch, and a third group the same diet with clover honey to replace the starch. All developed scurvy within two weeks, showing that the honeys contained no vitamin C.

Table 3.--Weight records and autopsy findings of guinea pigs receiving honey as the sole source of vitamin C

Guinea pig No.	Honey fed per 300 gm. of initial guinea pig weight	Weight of rat			Duration of experiment	Type of scurvy symptoms of autopsy	Autopsy findings[a]								Total of autopsy findings
							Bony system				Hemorrhages				
		Beginning	Maximum	Final			Jaw	Teeth	Ribs	Joints	Ribs	Intestines	Joints	Muscle	
	Grams	Grams	Grams	Grams	Days										
NO HONEY															
B 5	0	300	306	191	26	Severe	+++	+++	+++	+++	+++	++	+++	++	22
B 20	0	304	339	164	26	Very severe	+++	+++	+++	+++	+++	+++	+++	+++	24
B 40	0	344	350	184	23	Severe	+++	+++	+++	-	+++	+++	+++	++	20
Average					25.0										22
WHITE-CLOVER HONEY (NO. 1)															
B 11	1.32	310	310	227	20	Mild	++	++	++	++	-	-	Trace	Trace	9
B 37	2.78	347	359	196	28	Moderate	+++	+++	+++	+	Trace	+	+	do	12
B 13	2.86	378	397	244	27	Mild	+	+	+++	+	-	+++	++	+	12
B 39	2.90	350	390	249	31	Severe	++	+++	+++	++	++	++	++	+	17
B 38	3.19	340	352	194	26	do	+++	+++	+++	++	+	+++	+++	++	20
B 35	3.28	402	406	206	27	Moderate	+	+++	+++	+	-	++	++	++	14
B 26	3.39	353	365	192	24	do	++	++	+++	+	+	++	+++	++	16
B 7	3.40	314	380	214	37	do	+	++	+	++	Trace	++	+++	++	13
B 18	3.52	299	308	195	24	Severe	+++	+++	+	+	+++	Trace	Trace	Trace	11
B 14	3.67	321	373	233	28	do	+++	+	+++	+++	++	do	+	+++	16
B 16	3.70	296	311	164	26	do	+++	+++	+++	++	+	+++	+	+++	19
B 1	3.82	306	353	201	35	do	+	++	+++	+	Trace	+++	+	+	12
Average					27.7										14 3
BUCKWHEAT HONEY (NO. 2)															
70	.74	414	428	252	29	Moderate	++	+++	++	+	-	+	++	+	12
71	.99	420	420	224	25	Severe	+++	+++	++	-	++	+++	++	++	17
67	1.04	419	420	298	21	Moderate	+	+	+++	+	++	+++	++	+	14
68	1.09	419	429	229	35	Mild	+++	+++	Trace	Trace	-	+	+	+	9
69	1.16	427	466	238	35	Severe	+++	+++	+++	+	++	++	++	+	17
64	1.20	413	443	243	32	do	+++	+++	+++	+	++	+	++	+	16
63	1.63	413	413	249	21	Positive	++	++	+++	Trace	+++	+++	++	+	16
Average					28.3										14.4
LIGHT-COLORED WHITE-CLOVER HONEY															
75	.81	442	464	263	36	Severe	++	+++	+++	++	+	+++	++	++	18
73	.34	443	472	245	33	do	++	+++	+++	++	++	+++	++	++	19
76	1.20	453	461	291	29	do	+	+	+++	+	+++	++	+++	+++	17
74	1.42	437	453	261	25	do	+	++	+++	+	++	++	++	++	15
Average					30.8										17.3

[b] Intensity of scurvy symptoms is indicated by plus signs each having an arbitrary value of 1; minus signs indicate absence of symptoms

In 1922 Luttinger gave a general report of his findings on the use of honey in infant feeding in which he states that he found vitamins A, B, C present in 82 per cent of the honey examined. No experimental evidence was presented to bear out this statement.

Scheunert, Schieblich, and Schwanebeck, in 1923, examined three samples of honey for vitamins A, B, C, and concluded that none of the samples contained vitamins.

Caillas, in 1925, reported work done with pigeons which seemed to show that fresh honey contained vitamin B. The number of birds used, however, was too small to make the results very convincing.

Smith in 1927 found vitamins A and B in corn syrup and C in maple sugar.

The method used to determine the vitamin C content of honey was that described by Sherman, LaMer, and Campbell. No tests were made on the honeycomb. The basal diet described by Sherman consisted of skim-milk powder heated at 310° C. for 4 hours, 30 per cent; a mixture of equal parts commercial rolled oats and wheat bran, 59 per cent; butterfat, 10 per cent; table salt, 4 per cent. The guinea pigs were somewhat heavier at the beginning of the test period than the standard animal described by Sherman, which was usually lighter in weight. Some difficulty had been experienced in other work in getting the smaller guinea pigs to eat the basal diet satisfactorily. In these tests the preliminary period was continued until it was ascertained beyond a/doubt that the guinea pigs would eat
possible shadow ofa
the basal diet.

The honey was fed apart from the basal diet, and the test period was continued in each case until the guinea pig passed away. Honey is not relished by by guinea pigs, no more than is spinach by most children, and the feeding required a great deal of time and patience.
The intake of honey was calculated as grams per day per 300 gm. of initial body weight. Table 3 gives the results of the feeding tests. For purposes of comparison each plus (+) under autopsy findings has been given a value of 1 and these have been totaled for each animal, i. e. for each guinea pig.

On an average the guinea pigs that had the honey lived appreciably longer than those that had none. Before death and at autopsy all showed symptoms of scurvy that were as severe as the symptoms shown by the control animals. It is evident from these results that the three samples of honey examined contained no appreciable amounts of vitamin C.

The three samples of honey examined were produced in widely separated localities and represented extremes of color variation. No detectable amounts of vitamins A, B, C, or D were found in any of the honeys or in the honeycomb.

It appears doubtful that honey would prove a good source of Vitamin E. The authors plan later to undertake an investigation on the growth-promoting properties of honey as related to its iron, calcium and magnesium contents.

The pathological lesions found after death at autopsy of the rats fed honey and honeycomb as a sole source of vitamin A were very severe, and in some cases simulated those usually associated with vitamin E deficiency. The prevalence of black tongue in dogs and of pellagra in certain southern communities assumes added

Table 4.--Summary of tests made to determine the vitamin D content of honey and honeycomb as compared with a cod-liver oil supplement

Test food in the diet	Duration of test period	Number of cases of rats	Average intake of honey per 100 gm. of rat per day	Average value of line test
WHITE-CLOVER HONEY (NO. 1)				
	Days		Grams	
	0	11	---	0
0	11	5	---	0
	13	6	---	0
	15	1	---	0
	11	13	2.36	0
	12	2	1.98	0
30.0	13	13	2.39	0
	15	1	2.49	0
COD-LIVER OIL				
0.5	9	15	0.04	4
	11	2	.04	4
BUCKWHEAT HONEY (NO. 2)				
	0	4	---	0
0	13	2	---	0
	15	4	---	0
	11	2	0.70	0
10.0	13	3	.67	0
	15	3	.70	0
20.0	13	2	1.45	0
	15	2	1.42	0
LIGHT-COLORED WHITE-CLOVER HONEY (NO.3)				
0	0	3	---	0
	15	3	---	0
	13	12	1.49	0
20.0	15	12	1.50	0
HONEYCOMB				
	0	1	---	0
0	13	1	---	0
	9	3	0.80	0
10.0	13	3	.79	

importance by reason of this finding. It was also observed that the guinea pigs fed honey as a sole source of vitamin C quickly contracted scurvy, showing symptoms of this disease at autopsy. It is interesting in this connection to remember that the juice of lemons and of limes was used more than a century ago to combat this dreadfully devasting disease among sailors. For this reason British sailors are still often called lime juicers, limeys, or limers.

Edit the material given below. Make all corrections on the copy.

(1) The only other test variety now available is selection 1418, which contains the second Hussar factor which allows bunt to develop on about half the heterozygous plants.

(2) Subsequent to the preparation of this paper two additional reports have appeared.

(3) These results strictly in accord with previous experiments also furnish evidence that the seedlings are infected by Fusarium lycopersici Sacc.

(4) The livers of animals receiving four doses of copper sulphate at varying intervals showed approximately twice the copper content of livers of untreated sheep.

(5) It was not possible to obtain a positive blood reaction using the benzidine test.

(6) The data indicated that the livers of the sheep receiving copper sulphate solution weekly contained approximately ten times the amount of copper found in the livers of sheep not dosed with the copper sulphate solution.

(7) A limited amount of data using larger portions of the various kinds of carrots is summarized in Table 4.

(8) Considering the data summarized in Tables 2, 3, and 4, and Figure 1, there is some indication that the water-bath-processed carrots are slightly higher in vitamin C than the carrots processed in the pressure cooker.

(9) Temperature and moisture studies of nematode infection have been made by several investigators among which may be mentioned the prominent contributions of Neal, Stone and Smith and Bessey.

(10) Certain outstanding conditions in the range-livestock industry of to-day in Nevada are so directly traceable to antecedent causes that a clear understanding of those consequences is best obtained by a reference to the sequence of events that led to them.

(11) Since that time the percentage of bunt in this variety has been much lower, producing a maximum of 2.8 per cent in 1928.

(12) It is hardly probable that wounds at the graft union would be present following the middle of June.

(13) If a normal leaf is sprinkled with ethyl alcohol results are very similar to the application of water on glossy leaves.

(14) When a glossy leaf and a normal one, each being from white or very lightly colored virescent seedlings, are held up to the light, it can be readily discerned that the glossy is more transparent. By means of soaking such leaves in chloroform for five to ten minutes this difference can be removed, so that the normal will transmit as much light as the glossy.

(15) As far back as 1885 Frank recommends the drying of soil for a lengthy period to make it sterile of nematode life.

(16) Fifteen to 20 grams of raw carrot fed daily were required to protect a guinea pig against scurvy. Even when 50 grams of canned carrot were fed the animals died before the end of the test period and most of them developed severe cases of scurvy as indicated by postmortem examination.

(17) In general an increase in moisture content of the soil resulted in a root system having a decreased proportion of galls.

(18) Since glossy leaves have the property of collecting water in drops on their surface when seedlings are sprinkled with water, while normal leaves shed off water completely, classification of these two types in a segregating generation is facilitated by sprinkling the leaves with water.

(19) Being apparent as soon as the leaf emerges from the soil, glossiness continues until the plant is about twenty to thirty inches high and then it begins to fade.

(20) After digging the plants were immediately wrapped in burlap bags and placed in cold storage until withdrawn for freezing.

(21) Thus, in Table 3 are listed the percentage of plants showing crown and phloem injury or both occurring in the fall and spring tests.

(22) This injury consisted of cracks of varying depths and from a few millimeters to several centimeters in length on the roots of the plants.

(23) On the same root system of a badly infected tomato plant the size of galls may range from a partly round gall one-sixteenth of an inch in diameter to a gall one inch in diameter and three inches long.

(24) Temperature was early recognized as being of considerable importance in determining light or severe amounts of infection and hence this particular aspect of the problem was stressed with the hope that information might be forthcoming which would assist materially in the analysis of the storage problem.

(25) It will be noted that for the country as a whole the relative importance of forced and voluntary sales as a method of transfer have been approximately interchanged during the year.

(26) The probable cause of the dropping of the flowers was the inability of the plant to properly and adequately distribute the elaborated nutrients to the young fast-developing embryo.

(27) Bank failures in some sections have encouraged farm buying as a safer repository for funds than banks.

(28) Minnesota is not in as bad shape as one might infer however. They have plenty of feed as well as seed.

(29) The original diameter dimension measurements taken on the fibers and the two calculated constants derived from them were grouped independently for each of the three strains used in the test, for the purpose of determining whether sufficient skewness was present in any case to invalidate the use of the probable error concept in interpreting the results.

(30) Observations made by the writer show that even though pollinated, a great many flowers may drop during unfavorable weather conditions.

Material for a Popular Bulletin

An author has assembled the following skeleton of facts, and she desires your assistance in helping her to arrange them in logical order for effective presentation to the farm women of the United States. After she gets your expert advice she plans to assemble additional material to complete the framework you suggest.

She asks you to do the following:

1. Suggest a suitable title for the bulletin.
2. Prepare an appropriate topical outline of the material that should be included and list all the heads and subheads, properly indented, in a table of contents in logical order.
3. Carefully select the material that is to be included, cut and paste and arrange it under the appropriate heads and subheads you have prepared, and mark for deletion the parts you consider unsuitable for the purpose. In the margins opposite the omitted material state briefly the reasons for its rejection.

Proper care of food in the home is necessary to healthful, economical living. It is wasteful to allow food to lose its attractive flavor or appearance; moreover, spoiled or infected food may be actually dangerous to health or even to life.

Food generally shows when it is spoiled by an unpleasant look, taste, or smell. It may, however, be contaminated with organisms that make it unsafe for use, even though it still appears good. The causes of spoilage are many and varied, and foods differ greatly in the kind of care needed.

Fats and fat foods, such as nut meats and chocolate, should be kept cool and in covered, light-proof containers to prevent their turning rancid.

Bread and cake should be stored in a covered box or dish which is scalded frequently so that molds can not develop.

Flour, sugar, cereals, and other dry groceries should be kept dry and protected from household pests. Tea, coffee, and spices hold their flavor best in air-tight containers.

Canned foods keep best in a cool, dry closet or storeroom. Those in glass jars should be shielded from the light to prevent possible fading.

Under household conditions, the refrigerator is oftentimes the best means of keeping food cool. Choose one with well-insulated walls, put only clean ice and clean food in clean containers into it, and keep it clean by the daily practice of genuine neatness.

Adequate storage places and containers make for economy and safety in handling food in the home.

Many attempts have been made to destroy bacteria in milk by means of electricity, but no process has been devised which has been commercially applied to any great extent.

The general tendency in this country to-day is toward the Pasteurization of all milk for direct consumption, with the exception of certified or equivalent grades of milk from tuberculin-tested herds.

A good idea of the present extent of Pasteurization may be obtained from Table 1. It will be observed that there is an increasing tendency, which follows their increasing population, for cities to have Pasteurized milk and also to Pasteurize a higher percentage of the supply.

Table 1.--Proportion of cities having Pasteurized milk and average per cent of their milk supply which was Pasteurized in 1924.

Population of cities	Number of cities reporting Pasteurized milk	Number of cities with no Pasteurized milk	Per cent of cities having Pasteurized milk	Average per cent of milk Pasteurized
More than 500,000	9	0	100.00	98.1
100,001 to 500,000	37	0	100.00	81.7
75,001 to 100,000	19	0	100.00	66.6
50,001 to 75,000	25	0	100.00	66.6
25.001 to 50,000	58	2	94.4	67.0
10,001 to 25,000	84	21	80.0	42.5
Less than 10,000	53	20	72.6	33.6
Total.........	285	43	....	....

A rational view must be taken of the use of Pasteurized milk. Shall the protection against infection, which is made available by the proper Pasteurization of milk, be discarded because of its deficient antiscorbutic property, or shall its protection be accepted and the deficiency in vitamin C be made up by feeding orange juice or other antiscorbutics?

Since the beginning of history much interest has centered around the food habits of mankind. The earliest records are contained in the laws of primitive people prescribing more or less rigid rules of diet. Many books of travel, ancient and modern, reflect this same interest in the descriptions of the food habits of foreign peoples.

About 80 studies of food consumption and cost, covering from 1 to 25,440 families, have been made in the United States since 1875. From them information on food habits is available in more or less detail for 75,283 families.

The analysis of a dietary commonly involves the determination of energy and four to six food constituents. Such an analysis is usually made by finding the amount of energy and nutrients furnished by each food consumed and then totaling them to ascertain the amount furnished by the total diet.

The methods of Hunt and Rose provide only for the calculation of the energy, protein, fat, and carbohydrate of the diet. Since the three minerals-calcium, phosphorus, and iron-are so often deficient, it seemed desirable to include these minerals in the analysis of the farm diet. A third short-cut method of computing a dietary was therefore developed.

An illustration to show how to calculate the nutritive value of commercially canned foods follows.

Figures for canned fruit are somewhat less simple because of the sugar that is added. The commercial grade most commonly used is choice, which contains sirup with 20 to 25 per cent sugar.

Successful canning is based on an understanding of the two following important causes for the rapid spoilage of fresh foods and on a knowledge of the methods by which this spoilage may be prevented.

In killing bacteria by heat in canning, both the degree of temperature and the length of time it is applied must be considered. A very high temperature may produce a sterile product that will keep well, but this may be at too great a sacrifice of flavor and texture.

The types of organisms present vary with different foodstuffs and to a certain extent with geographical distribution.

Since a number of cases of food poisoning have been directly traceable to botulism, the bacteria causing it have been studied in order to find the temperature and conditions necessary for destroying them.

All foods should be inspected before their preparation for the table. Canned food is no exception to this rule. Spoilage in canned food is due to either understerilization or improper sealing. If the directions given in this bulletin are followed, spoilage should not occur. Nevertheless, it is recommended that samples from each lot be held in a warm place for a period after canning to determine whether or not the product is keeping before it is stored away.

Containers for canned products must be so constructed that they can be sealed air-tight to prevent the entrance of air which contains bacteria, yeasts, and molds.

Vegetables and fruits can be dried in an oven, in trays or racks over the kitchen stove, or in a specially constructed drier. There are small driers on the market which give satisfactory results. The small cookstove driers or evaporators are small ovenlike structures, usually made of galvanized sheet iron, or of wood and galvanized iron.

Fly control should begin at the breeding places. All refuse or other substances in which flies may breed should be disposed of immediately. Fly traps should be placed around the house and stable and in places frequented by flies, so as to catch them whenever they appear.

A very useful convenience for the farm home, where ice is not obtainable, is the iceless "refrigerator". It will keep meats, fruits, and vegetables cool, and will extend the period for keeping milk and butter. It can also serve as a cooler for drinking water. In homes where large quantities of milk and butter are to be kept, it would be well to have one refrigerator for milk and butter, and another for other foods, as milk and butter readily absorb odors from other foods. It costs very little to build the refrigerator and nothing to operate it.

Fireless cookers are now being made and used in hundreds of country homes. What is more pleasing to the farm woman than to put her dinner in the fireless cooker before she drives to town to market her products, and upon returning find it is ready for serving?

Some foods are improved by long cooking at relatively low temperature. The texture and flavor of tougher cuts of meat, old, tough fowl, and ham are improved by slow cooking. Cereals, dried legumes, and dried fruits are more palatable and wholesome when cooked for a long time.

For keeping food during cool weather a cold box will be found very satisfactory. An ordinary light box can be used or one can be easily and cheaply made for the purpose. The box is fitted to the outside of the kitchen or pantry window. The north exposure is the coolest location.

The storing of late vegetables is an economy for those who grow them in sufficient quantity for the needs of the family.

To care for the surplus vegetables in many cases requires nothing more than the use of existing facilities in or near the home.

Sometimes it is possible to build a storage cellar as the lower story of and foundation for an outbuilding. When this is done it is desirable to have the cellar almost entirely under ground and well insulated by banking the outside walls with dirt.

Outdoor banks or pits are used very generally for keeping vegetables.

A type of storage cellar much used in northern sections of the country is built partly under ground. The walls are of masonry and extend to a point just above the surface of the ground.

Outdoor storage cellars or caves are excellent for the storage of many vegetables.

An aboveground storage cellar suited to conditions in southern sections of the United States may be built on a well-drained site at slight expense.

In the evolution of dietary scales different units have been used. The earliest investigators considered the needs of two children as equal to those of one adult, which they regarded as their unit. From this beginning two methods have developed. These are shown in Table 2.

Table 2.--Dietary scale used by W. O. Atwater in 1886

Members of family	Voit's standard	Atwater's scale	Members of family	Voit's standard	Atwater's scale
	Calories per day	Relative quantities of potential energy		Calories per day	Relative quantities of potential energy
Laboring man at moderate work	3,055	10	Children, 6 to 15 years	2,041	7
Woman at ordinary work	2,426	8	Children, 2 to 6 years	--------	5
			Children, to 1½ years	767	2½

In analyzing a diet for its adequacy it is necessary to know two things--(1), how much of the various nutrients a family needs for its health and proper development, and (2), whether the food that is consumed supplies the necessary nutrients in adequate quantities.

The evidence available on the protein and mineral needs of children indicates that the relative demand for these nutrients does not run parallel with the child's demand for energy.

Proteins have been defined as nitrogenous chemical compounds of great molecular weight which give colloidal solutions and which on analysis yield amino acids as cleavage products.

Research on the proteins of food materials resolves itself, therefore, when viewed from a practical standpoint, into a study of the quantity and quality of the different proteins in foods and feedstuffs.

In biological tests, unless pure, isolated protein is being used, or the effect of nonprotein nitrogen is eliminated, would it not be more accurate to speak of the protein value of corn, for instance, rather than the biological value of its protein?

All proteins contain nitrogen. Many years ago, when the comparatively few proteins known were chiefly of animal origin, such as serum albumin and serum globulin from blood and casein from milk, it was found that these proteins contained about 16 per cent nitrogen.

In order to determine what effect, if any, pasteurization has upon the formation of foam, the various milks and cream were pasteurized at 62.5° C. for 30 minutes and immediately cooled to 5°.

The foaming of milk and cream often results in much loss of both product and labor. Foam present in pasteurizers during the pasteurization process may become a public-health problem.

The formation of foam on milks of different butterfat content and the cream used in this experiment was determined at various temperatures and ages.

Such household storage places as attics, basements, cellars, and sheds do not, of course, need to be so frequently or carefully put in order as the living rooms, but they should be gone over often enough to keep their contents in good condition and to prevent dirt from being carried from them into the other parts of the house.

Bacteria, yeasts, and molds--three types of microorganisms--are the most important and insidious of all causes of food spoilage.

Insects, rats and mice, and other household pests not only destroy and pollute foods in obvious ways, but they may also infect them with microorganisms dangerous to health.

Two important qualities of market milk are safety and richness. Most consumers are not in a position to determine with any degree of accuracy the safety of the milk which they receive, but depend upon the health authorities to provide protection. The richness is judged

by the housewife almost wholly by the amount of cream that can be seen at the top of the bottle, and not by the actual butterfat content as determined by the Babcock test.

The cream volume of milk pasteurized at temperatures from 143° to 145° F. was greater after two or three hours' storage at low temperatures than in the original raw milk. This gradually decreased as the storage period was prolonged.

Mechanical filters to remove the insoluble dirt from milk have been developed to a considerable degree in the past few years. At some plants the milk is filtered before pasteurization, although the more common practice is to filter it after it has been heated to 145° F. or after it has been heated and held.

Some arrangement for keeping perishable foods cold and clean during summer and winter is necessary. A refrigerator in the kitchen is probably the most convenient of all, especially if equipped for outside icing and provided with a drainage connection, or if electrically operated. The door for outside icing has the additional advantage that in cold weather it can be screened and left open and the refrigerator cooled without ice.

The grouping of equipment, small as well as large pieces, into work centers is one of the most important and oftentimes one of the easiest things to accomplish in making a kitchen convenient.

Raw food is prepared chiefly at sink and worktable. At the sink, fruits and vegetables are washed and pared, and utensils are filled with water for cooking. Near the sink, then, should be kept brushes, knives, colander, strainers, and similar tools; stewpans, double boilers, and other utensils that are filled with water before they are put on the stove; and a garbage can.

A convenient kitchen is one in which the necessary work can be done with the least possible effort.

Ideally the kitchen should be built around the necessary equipment. Floor space, windows, doors, and other stationary features can then be planned to the best advantage, and centers for various kinds of work can be so placed that the space needed for one will not be cluttered by the equipment of another.

The effect that pasteurizing milk before it is separated has upon the viscosity of the cream depends upon the manner of handling the pasteurized milk. Cream with a butterfat content of 30 per cent from milk pasteurized and separated without cooling had a relative viscosity, at 24 hours of age, 8.85 per cent lower at 5° C., and 9.24 per cent lower at 10° than similar cream separated from similar milk at 26° and pasteurized after being separated.

Raw or pasteurized cream that has been cooled slowly has a higher viscosity than raw or pasteurized cream that has been cooled rapidly.

The lower the separating temperature, the higher the viscosity of cream.

Cream from milk pasteurized before being separated has a lower viscosity than when the cream is separated and then pasteurized, unless the pasteurized milk is cooled slowly before being separated.

Homogenization of cream increases its viscosity. The increase in viscosity is in direct relation to the homogenizing pressure.

Milk and cream are among the most perishable and easily contaminated of all foods, and since they are often served uncooked, they may be a menace to health unless produced and handled in a cleanly way.

The coldest place in the refrigerator should be reserved for the most perishable foods, such as milk and meat. This is usually just below the ice chamber, but it can easily be located with a reliable thermometer.

The moist, cut surfaces of dressed meats, poultry, and fish offer particularly favorable conditions for the growth of microorganisms that cause putrefaction; therefore every precaution should be taken to keep such foods clean, cold, and dry.

All fats should be kept cool, covered, and in light-proof containers, for heat, light, and air tend to make fats rancid.

Rose divides the foodstuffs into seven main groups--namely, cereals and cereal products, dry legumes and shelled nuts, vegetables and fruits, carbohydrates, fats, foods rich in fat and protein, and animal products exclusive of whole milk and fats.

Heat and cold, light, and loss or absorption of moisture have other effects on food spoilage besides those connected with growth of bacteria, yeasts, and molds.

The keeping quality of eggs is seriously affected by rough handling, changes in temperature, dampness, dirt on the shells, unclean surroundings, and fertility. Fertile eggs tend to spoil more quickly than those that are infertile, for even room temperature (70° F.) aids the development of the embryo in a fertile egg.

Jellies, jams, and home-canned fruits and vegetables should be kept in a clean, dry, cool closet or storeroom, preferably on narrow shelves so that the supply can be looked over easily and spoilage quickly detected.

All the woodwork, the shelves, and the pans should receive two coats of white paint and one or two coats of white enamel. This makes a very attractive surface and one that can be easily kept clean. The screen wire also may receive the coats of enamel, which will prevent it from rusting.

The three important principles to consider in the subject of water supply for the farm home are: (1) It is necessary to have clean water, (2) there should be convenient and serviceable equipment to furnish running water in the house, and (3) this convenient supply of safe water should be obtained with economy.

The keeping quality of foodstuffs, such as flour, sugar, raising, dried corn, and rice and other cereals, depends chiefly on the fact that they are dry.

Moist cooked foods, especially those made with protein-rich materials, such as milk, eggs, meat, or fish, are excellent breeding places for harmful microorganisms, including those that cause serious poisoning without making the food smell or taste spoiled.

A sink connected with a plentiful supply of hot and cold running water and with a sanitary drainage system probably saves more labor than any other one piece of equipment that can be installed in the kitchen.

In order to supply adequate light and ventilation, it is a good plan to have windows in two walls, or one or two windows in one wall and an outside door in another. This insures a cross draft to carry away heat and odors, though the stove should be placed if possible so that the draft does not strike it directly. The outside door should have a screened transom for ventilation, and, if needed, should have glass in the upper part for light.

INSTRUCTIONS: Edit the following material for publication in popular form. Make corrections or changes on these sheets. Then, if you are dissatisfied, rewrite the material on separate sheets and attach them to the edited sheets.

KEEPING FOOD FROM SPOILING

INTRODUCTION

Since 1875 food consumption and cost studies covering from 1 to 25,440 families about 80 have been conducted in the United States which led to the collection and making available of information with relation to food habits as practiced in more or less detail by approximately 75,283 families. Around the food habits of mankind since the beginning of history has centered much interest as reflected in many books of travel, ancient and modern and in which are descriptions of the food habits of foreign peoples while the earliest records of the more or less rigid rules of diet are contained in primitive people's laws, which refer to food habits.

Thus it becomes readily apparent that for healthful, economical living it is necessary that proper care of the food in the home is a primarily essential necessity and that it is wasteful if the attractive flavor or appearance of food is allowed to be lost while conditions may

be given rise to by spoiled or infected food that are or may be actually dangerous both to health and life.

This condition generally shows when it is spoiled by an unpleasant look taste or smell of the food, being perhaps however contaminated with organisms which make it unsafe for use though still appearing good.

REFRIGERATORS

For a container to maintain cold temperatures for foods which hinder the development of many bacteria in cool weather a box called a "cold box" consisting of an ordinary light box or can be easily and cheaply made for the purpose will be found equally as satisfactory as, if not superior to, in many ways a commercial refrigerator, when placed in a north exposure which is coolest. Also a very useful convenience for the farm home, where ice is not obtainable, is the iceless "refrigerator" which will keep meats, fruits and vegetables cool and extend the period of keeping milk and butter also being a cooler for drinking water.

The magnitude of expense of the operation of this type of cooling mechanism is non-existent and its construction is an extraordinarily small item of expenditure. However, the refrigerator oftentimes under household

conditions is the best mbthod of keeping food cool. One should chose a refrigerator with well-insulated walls, putting only clean ice and clean containers in it, and one should keep it, by the daily practice of genuine neatness, clean. In achieving the greatest effectiveness in its operations there should be, at all times, considerable ice present in the ice chamber. Probably the most convenient of all, especially when equipped for outside icing and provided with a drainage outlet and if electrically operated, are refrigerators in the kitchen for keeping perishable foods cold and clean during summer and winter.

The door for outside icing has the additional advantageous feature that when screened and left open in cold weather it can be cooled without ice, the expense being thus decreased.

MICROORGANISMS

Excellent breeding places for harmful microorganisms are provided by moist cooked foods especially those in which are found to be present protein-rich materials such as milk, eggs, meat, or fish. Such organisms are among those which may be the sources of serious poisoning without making the food smell or taste spoiled and their development is hindered

by being placed in a place where the temperature is cool. From the viewpoint of the spoilage of food the most invidious of causes include among their numbers three types of microorganisms tabulated as follows: Bacteria, yeasts, and molds. The types of organisms found to be present vary very greatly in their occurrence in connection with various foodstuffs and geographical distribution to a certain extent also is a fundamental factor in this phenomenon.

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TITLES, TABLES OF CONTENTS, AND HEADINGS

1. Edit the following titles of publications as required by clarity, brevity, grammatical construction, or approved usage, or, if the information necessary for editing is lacking, state the faults of the titles as given. Make all changes or statements on the copy. Extensive revisions should be written in the spaces beneath the original titles.

2. Rewrite the tables of contents given below. Prepare them in proper form and in what would seem to be more logical order, showing indentions as necessary.

3. Examine the headings and subheadings in the publication handed you. If you think they are faulty in any respect rewrite them in the order and form you consider preferable. If you think no editing is required state your reasons specifically. Do not write on the publication but on a separate sheet. Clip the sheet to the publication and hand both in with the other material of this exercise.

TITLES

A Preliminary Report Covering experiments on the Use of Sodium Chlorate and Other Materials as a Herbicide in the Eradication of Field Bindweed.

Relation of the method of Watering to water Consumption and Milk Production of Dairy Cows.

Experiments in bettering Turpentining methods for slash and Longleaf Pine.

How to find and apply Economic Facts as a Basis for extension programs in Home Economics, Dairying, and Forestry.

Studying the Effect of Environment on the Development of Disease and Selecting for Disease Resistance Presents Problems in Cooperation in Research.

Growth

The acid Relations of Soils in Relation to crop production.

Plowing in its Effects upon the Fertility of the soil.

Control measures such as Spraying, Fumigation, and Clean cultivation.

Local lesions in tobacco mosaic.

A peculiar freezing trouble of pears in cold storage.

Beef producing qualities of purebred Aberdeen-Angus cattle compared with Arkansas native cattle.

Grain mixtures supplementary to Wyoming native hay for milk production.

Highways in the United States of America and its possessions.

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Compounds of the Rice Kernels as Compared with Those of Other Cereals

On the Life History, Habits, and Economic Importance of Some Monochs.

The Relation of Maturity to the Nutritive Value of First, Second, and Third Cutting Alfalfa.

Calcium and Phosphorus Metabolism in Dairy Cows. II. The Relative Assimilation of Clover and Alfalfa Hays and of Rations of Varying Calcium and Phosphorus Content.

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Keeping Farm Accounts

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Growth of trees and forests
Protecting woodlands
Forest Planting.
How forests reproduce themselves
Marketing Timber grown on the farm.
General information regarding farm woodlands.
Why farmers should have farm woodlands
Different types of farm forests
Agencies that damage farm forests
Where to locate the farm woodland
How to improve the woodland by thinning
Measuring and estimating the timber grown.
The products that may be made
Forest fires and animals

LITERATURE CITATIONS AND BIBLIOGRAPHIES

The following citations are taken, for the most part, from manuscripts recently submitted by the bureaus of the Department of Agriculture and by the State agricultural experiment stations for publication in the department series of publications.

It will be noted that there is a lack of uniformity in the arrangement of the various items that make up the citations, such as author's name, date, title, etc. The list should be so arranged that the authors' names are in proper order, which may be indicated by numbering the citations. Each citation should be corrected for errors in arrangement; omissions should be indicated; and any unnecessary information should be deleted. If only slight changes are necessary, the editing may be done on the copy. If, however, it is found necessary to make extensive changes, the citations should be rewritten. It may be assumed that the information given is correct and that it is not necessary to check for accuracy by comparison with the original publication.

For the benefit of those who do not have access to Department Bulletin 1330, Abbreviations Employed in Experiment Station Record for Titles of Periodicals, a list of all the necessary abbreviations is included.

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Abbreviations for Single Words

Agr. - Agriculture, Agricultural, Agricole, Agricoltore, Agricolo, Agrarie.
Akad. - Akademie, Akademiens, Akademii, Akademische.
Amer. - America, American, Americana, Américaine.
Aust. - Australia, Australian.
Bakt. - Bakteriologie, Bakteriologo, Bakteriologischen.
Biol. - Biology, Biological, Biologie, Biologia, Biologico, Biologique, Biologisch, Biologiske.
Bul. - Bulletin, Bullettino, Buletinul.
Bur. - Bureau.
Centbl. - Centralblatt.
Chem. - Chemist, Chemists, Chemistry, Chemical, Chemie, Chemiker, Chemické, Chemický, Chemisch.
Col. - College, Colegio.
Com. - Committee, Commerce, Commercio, Commercial, Comite, Comitato.
Dept. - Department, Departmental, Departement, Département, Départemental.
Doc. - Document, Documentary.
Ed. - Edition, Education, Educational, Educator.
Expt. - Experimental, Experiment, Experimentelle, Experimentellen, Expérimentale.
Geol. - Geology, Geological, Geologist, Geologi, Geologia, Géologie, Geologisch, Gelogiska, Geologiske.
Hyg. - Hygiene, Hygiène, Hygienic, Hygienisch.
Indus. - Industry, Industries, Industrial, Industria, Industrie, Industriei, Industriale, Industrielle.
Inst. - Institute, Institution, Institut, Instituta, Instituto.
Jour. - Journal.
K. - Kaiserlich, Königlich, Koninklijk, Kongelige, Kungliga.
La. - Louisiana.
Minn. - Minnesota.
Monatsber. - Monatsbericht.
Mycol. - Mycology, Mycological, Mycologici, Mycologique, Mycologische.
N. Y. - New York.
Phytopath. - Phytopathological, Phytopathologique, Phytopathologisch.
Preuss. - Preussens, Preussisch.
Rev. - Review, Revue, Revenue, Revised, Revista.
Sci. - Science, Sciences, Scientific, Scientifico, Scientifique, Scientiarum, Scienze.
Sta. - Station, Stationen, Stantsii Stantsiia.
U. S. - United States.
Vet. - Veterinary, Veterinarian, Vétérinaire, Veterinär, Veterinaria, Veterinarnoe.
Wiss. - Wissenschaft, Wissenschaftlich.

TERMS USED IN PRINTING.

Type body.--Em (mutton) quad and dash is the square of the size of the type; en (nut) quad is one-half the size of the body. Spaces are 1/3, 1/4, and 1/5 the size of the body.

Caps and small caps.--Caps are capital letters as ordinarily used in printing; small caps are about 2/3 the size of the caps and usually align with the lower-case m.

Upper case and lower-case.--Names given by the early printers on account of the capital letters being placed in a case set at an angle above the case containing the small letters.

Composing room--A place where type is set and matter made up for printing.

Composing stick--A metal device used by compositors to hold type while being set up into lines. It can be set to accommodate any length of line. It is usually about 2 inches deep. In newspaper parlance "about two sticks" indicates that the article will occupy about 4 inches of space in the newspaper.

Copy.--All material furnished the printer to be used in the production of printed jobs.

Copyholder.--One who reads copy to the proofreader.

Live matter.--Type which is being held for further use. Dead matter is type which has been used and is ready for distribution.

Leaded matter.--Type which has a 2-point peice of lead between the lines. Double leaded matter has 4 points between the lines.

Off its feet.--Type is said to be off its feet when it does not stand upright.

Fat and lean type.--Fat type is an extended type; lean type is a condensed type.

Font.--A complete assortment of any size or style of type. If a letter gets into a wrong case it becomes a "wrong font" letter. It is marked wf. in proof.

Hell box.--A box kept in a composing room in which is placed all broken and mashed type and other metals.

Indention.--When a line stands in further than another it is said to be indented. Paragraphs are usually indented. A hanging indention is when the first line is set flush and the second and succeeding lines are indented.

Overrunning.--Carrying over words from one line to another in order to insert additional matter.

Signature.--Small numbers put at the foot of the first page of each form for the guidance of the binder. In Government work the jacket number is also given. Each form (usually 16 pages) is called a signature.

Sink.--Blank space placed at the beginning of a chapter of a book or at the top of the first page of a bulletin.

Slugs.--Pieces of metal similar to a lead but thicker; usually 6, 8, 10, or 12 points thick, used on each side of a center head. A line of type cast on the Linotype machine is also called a slug.

Spacing.--Putting the proper amount of white space between words, lines, and groups.

Letter spacing.--Placing a thin space between letters of a word in order to fill out the measure; ordinarily resorted to in narrow measures only.

CROSS REFERENCES--See and See also

1. See refers from a possible heading under which the references are given to the chosen heading where they may be found:

   Swine. See Hogs.

   See references may be divided as follows:

   a. From a subject heading under which reader might reasonably expect to find material to the heading chosen:

      Zebu cattle. See Cattle, Brahman.

   b. From a scientific to a popular name:

      Medicago sativa. See Alfalfa.

   c. From a popular to a scientific name:

      Alfalfa. See *Medicago sativa*.

   d. From a word not spelled in accordance with the Style Manual or department usage, to the approved form:

      Gypsy moth. See Gipsy moth.
      Live stock. See Livestock.
      Potatoes, sweet. See Sweetpotatoes.
      Syrup. See Sirup.

2. See also connects headings which represent allied subjects:

   Slaughtering. See also Butchering.

   See also references connect:

   a. Class and specific headings:

      Rodents. See also Gophers; Mice; Prairie dogs; Squirrels.
      Beverages. See also Coffee; Milk; Tea.

   b. A subject with its subdivisions:

      Botany. See also Cytology; Ecology; Histology; Pathology; Taxonomy,

   c. Headings which are related or contain allied matter:

      Laws. See also Legislation.
      Hunting. See also Game.
      Slaughtering. See also Butchering.

3. The words "see" and "see also" must be in italic in indexes only. Set "see" and "see also" in roman when they precede italic words. (Style Manual, p. 49.)

F I L I N G

1. Arrange cards in alphabetical order---by first words, letter by letter; then by second words, letter by letter, etc.

    Black rot, apple
    Black stem rust, barley
    Blackberry diseases
    Blackbird, study

2. Dates precede words.

    Rust control
    Rust control, 1911
    Rust control, 1912
    Rust control and eradication
    Rust control by spraying

3. Figures are filed as if spelled out.

    Pine, cork
    Pine, 5-needled
    Pine, jack
    Pine, white

    Clubs, boys and girls
    Clubs, [illegible]
    Clubs, poultry

4. File prefixes S. and St. as if written out.

    Sable, protection laws
    St. Louis, milk laws
    Sales, cattle, at Chicago.

5. File cross references at the end of the subject if general, or, if specific, at end of modification to which they refer.

    Poultry, marketing. <u>See</u> Marketing, poultry.
    Poultry. <u>See also</u> Chickens.

6. In a large index it is often expedient to combine singular and plural entries.

    Apple(s)
    Blackberry(ies)
    Fly(ies)
    Potato(es)

7. When the same word serves for several kinds of heading, the order should be: Person, place (cities before States), subject.

    Cotton, John
    Cotton (City), Alabama
    Cotton, acreage

    Washington, Booker T.
    Washington (D. C.) or (City)
    Washington (State)

The following represent part of a larger index. The various entries are supposed to be separate slips roughly alphabetized under the initial letter only. Arrange in alphabetical order on another sheet of paper, and prepare them for the printer in accordance with instructions.

<u>Agrotis</u> <u>ypsilon</u>, life history and control.

Beattie, James R.: "Greenhouse tomatoes."

Blight. <u>See</u> <u>also</u> <u>under</u> <u>specific</u> <u>host</u>.

Beattie, W. R.: "Muskmelons."

Carpets, old, utilization.

Chestnut blight, occurrence and control.

Cutworms. <u>See</u> <u>Agrotis</u> <u>ypsilon</u>.

Carpet grass, harvesting.

Horse, use on farm.

Horses, breaking and training.

Hickory (cloth), definition and uses.

Hickory, growth in different regions.

Insects, carpet beetles, description.

Lee, Alfred R.: "Care of baby chicks."

Lee, A. R.: "Care of mature fowls."

Mouse. <u>See</u> Mice.

Mice, poisoning, directions.

Mouse, control in field and orchard. James Silver.

Tomato blight, control measures.

Windbreaks, farm asset.

Washington, game laws for 1930.

Wind, movement, effect of windbreaks.

Washington, fur laws for 1930.

Washington, Thomas H.: "Hog cholera."

Washington (City), milk supply.

DISCRIMINATION IN THE USE OF WORDS

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(1) The most difficult problem is encountered where steep slopes have light porous soils.

(2) Small dimension stock offers one of the most profitable forms into which low grade and defective hard woods can be converted.

(3) From the results of previous investigators Davis definitely stated that these repellants were affective.

(4) Investigations conducted througout the entire United States, including important breeding grounds in Canada, indicated the condition serious.

(5) Average yields and feeding value of wild grass hay is usually much less than that of alfalfa and some less than other tame hays.

(6) The Southern Forest experiment Station studied the effects of turpentining on long leaf pines(pinus Palustris.) Having withstood turpentining, the Experiment Station found that saw-flies larvae(Neodiprion lecontei Fitch) and tipmoths(Rhyacionia frustrana Comst often attach long-leaved pines.

(7) There is abundent evidence and several government publications to prove that there is plenty of water in these localities.

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(9) Farm lands are to be found in any quantity in only a few places in Nevada.

(10) During the half-century since questions of tenure were first included in the federal Census, the percentage of tenant operated farms has increased from 25.6 per cent in 1880 to 42.4 percent in 1900.

(11) 17 states were drought-stricken. In two of the drought stricken States, however the composite crop yield was above prewar, as only part of each state was drought stricken.

(12) Among other commendations Godfrey says "The pigeon pea has proved to be one of the most resistant legumes planted".

(13) A major advance in solving this extremely difficult problem can be with some confidence asserted.

(14) Occasionally a pruning of young shoots is taken and given to cattle." Thousands of cattle have been fattened with favorable results at ranches where pigeon peas were grown.

(15) The worn-out lands may be restored to their original, or to improved fertility.

(16) It is not surprising therefore that even the composite judgement of experienced observers may at times fail dismally to appraise correctly the present worth of prospective returns for even a reasonably short period into the future, with the inevitable result that the market prices of a given period, when reviewed in retrospect, may appear to have been inordiately high or unexcuseably low. The most recent outstanding outstanding example concerns the decade 1920-30.

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(18) Applied to land values, past studies indicate that the experience of the years immediately preceding the date of valuation tend to be given the most weight in judging present values.

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(20) Although still in process of experimentation, some progress has been made in the development of satisfactory equipment.

(21) Voluntary sales have become a small factor in recent years for two reasons: First, buyers had a wide choice of farms offered at a sacrifice; and second, buyers who did not have to sell are inclined to offer their property at present prices.

(22) These figures disprove one generalization that has often been made and which is accepted as true by many.

(23) The sweetfern grows in dry, sterile soil so frequently peopled by the poor pitch pines.

(24) Significant tendencies exist in urban and rural birth rates.

(25) Farmers who are operating poor land should be encouraged to find better opportunities in agriculture or other occupations. This will include land peculiarly subject to erosion.

Material for a Popular Bulletin

An author has assembled the following skeleton of facts, and he desires your assistance in helping him to arrange them in logical order for effective presentation to those particularly interested in the subject. After he gets your expert advice he plans to assemble additional material to complete the framework you suggest.

He asks you to do the following:

1. Suggest a suitable title for the bulletin.

2. Prepare an appropriate topical outline of the material that should be included and list all the heads and subheads, properly indented, in a table of contents in logical order.

3. Carefully select the material that is to be included, cut and paste and arrange it under the appropriate heads and subheads you have prepared, and mark for deletion the parts you consider unsuitable for the purpose. In the margins opposite the omitted material state briefly the reasons for its rejection.

Roaches are among the commonest and most offensive of the insects which frequent human habitations. They belong to a very extensive family, the Blattidae, comparatively few of which, fortunately, have become domesticated. In temperate countries some four or five species are very common household pests, and a few occur wild in the woods; but they are essentially inhabitants of warm countries, and in the Tropics the house species are very numerous, and the wild species occur in great number and variety, many of them being striking in shape, coloration, and size, the wing spread of one species being more than 6 inches. Under suitable conditions in the more northern latitudes the domestic species often multiply prodigiously, and even in the far north a species occurs in the huts of the Laplanders, and sometimes entirely devours the stores of dried fish put away for winter consumption.

Fleas are of many kinds. The dog flea normally feeds on dogs and cats, but when excessively numerous may prove a troublesome pest to man; the human flea normally attacks man, but may be found on a number of other animals; rat fleas, in the absence of their usual hosts, will bite man, and these fleas are the ones ordinarily responsible for the inoculation of man with bubonic plague.

The house roaches are rather uniformly dark brown or dark colored, corresponding with their habit of concealment during daylight. They are smooth and slippery, and in shape broad and flattened. The head is bent under the body, so that the mouth parts are directed backward and the eyes directed downward, conforming with their groveling habits.

The common clothes moths are usually seen flying in darkened corners and just beyond range of the brightest rays of the lamp. They prefer darkness. They are frightened when clothing and other objects are suddenly moved, and are then seen running rapidly or flying to conceal themselves in the creases of clothing, cracks, or other dark places.

There are two very common species of clothes moths. They are the case-making clothes moth (Tinea pellionella L.) and the webbing clothes moth (Tineola bisellliella Hummel). The tapestry moth (Trichophaga tapetzella L.) is less often found, though it may become destructive.

Certain general principles regarding the control of fleas are applicable to nearly all species, but some modifications of the methods employed are necessary for different species, and under the different conditions in which they exist. Two steps are necessary to cope with the pest: (1) The destruction on the host of the adults which are producing the eggs, and (2) the clearing out of the immature stages which are breeding in or under the house.

Undoubtedly the most efficient remedy for the bedbug is to fumigate the infested house or rooms with hydrocyanic-acid gas. This gas will penetrate into every crevice in the house or room where the bedbugs conceal themselves and has an immediate effectiveness which gives it an important recommendation, especially when the infestation is considerable or of long standing. This method of fumigation should be intelligently employed, as the gas is deadly poisonous.

The distinctively house-inhabiting ants, such as the little red or Pharaoh's ant, and other imported species nesting in the woodwork, masonry, or articles of furniture, etc., are often very difficult to eradicate because of their inaccessibility. If the nest can be located by following the workers back to their point of disappearance, the inmates of the nest, if near by, may sometimes be reached by injecting a little disulphid of carbon, kerosene, or gasoline into the opening by means of an oil can or small syringe.

Trichinosis is a parasitic disease caused by small roundworms bearing the scientific name, Trichinella spiralis, and commonly known as trichinae. These parasites occur primarily in human beings, hogs, and rats, and to some extent in dogs and cats.

The stable fly, or stock fly, is one of the most important sources of annoyance to livestock throughout the United States. "Stable fly" is not entirely satisfactory as a common name for this pest, as it is frequently abundant in open fields and along roadways and is not uncommonly encountered about the house. Nevertheless it is found about stables more frequently than anywhere else. In certain localities such names as the "stable fly," "wild fly," "straw fly," and "biting house

fly" are applied to it. As the last name suggests, this insect is frequently confused with the house fly. The common house fly is not capable of biting, its mouth parts being soft and broad on the tip.

Since the discovery that mosquitoes are not only nuisances, but also conveyors of malaria, yellow fever, filariasis, and dengue or breakbone fever, a great deal of remedial work has been done by individuals and communities, and, during the last few years, by the medical departments of the Army and Navy and the Public Health Service in the vicinity of camps, cantonments, and naval stations.

Popularly the yellow-fever mosquito has been called in the Tropics the house mosquito, the day mosquito, the banded-legged mosquito, and is now generally known as the yellow-fever mosquito. Sometimes also it is known popularly by one of its discarded scientific names, the Stegomyia mosquito.

There are now in North America a considerable number of species of ants which under favoring conditions may inhabit dwelling houses or other heated buildings, constructing their nests and breeding continuously in the woodwork or masonry, or in articles of furniture or of ornament, and subsisting on food materials which they find about kitchens and pantries or scattered in living rooms.

The Argentine ant has reatly exceeded other species in its injury. Other ants may make themselves troublesome, but the Argentine ant goes so far as to cause homes to be vacated in an infested neighborhood. It becomes important in agriculture as well, damaging fruit and other crops by its propagation of scale insects. The worker ants are most commonly seen. Small in size and dark brown in color, they are able to invade practically every part of ordinary dwellings, stores, etc. The Argentine ant is almost omnivorous, eating most cooked foods and a considerable percentage of the raw foods found in the average pantry.

When you find such plants as seedling tomatoes, cabbage, lettuce, and melons cut off near the ground, especially in the spring and early summer, it is fairly certain that a cutworm is responsible for the damage.

It is easy to get rid of cutworms by using a poisoned-bran bait. Thoroughly mix the poison with the bran. This is important. Each particle of bran must carry a little poison to get a good kill.

The spinose ear tick takes its common name from the characteristic spines on the body of the young tick and from its habit of locating in an animal's ears.

Any dense smoke will drive away mosquitoes, and various smudges are used by campers. For household use a number of different substances have been tried.

Like all other flies, the stable fly has four stages in its life history--namely, the egg, larva, pupa, and adult.

The life of the flea has four distinct stages, as is the case with many other insects; these stages are the egg, larva, pupa, and adult.

The remedies here listed for the killing of clothes moths, or for protection against them, have been thoroughly tested and are in general use by the public. They can be recommended without reservation if used with an intelligent understanding of their good or bad features and in accordance with directions given.

Here are some suggested regulations for preventing termite attack which should be made a part of city building codes. In repairing termite-damaged buildings use the same suggestions as for the construction of new buildings. If you do so you can get rid of termites in buildings where they are already working.

The common intestinal roundworm or ascarid is one of the most injurious of the various kinds of parasites that infest the pig.

Although the yellow-fever mosquito apparently does not fly far, it is readily carried to great distances accidentally by artificial means. Vessels once infested, may carry the species to far-distant ports. The yellow-fever mosquito has been found in New York upon vessels coming from Vera Cruz, and it is by such carriage of infected mosquitoes that the early outbreaks of yellow fever in Philadelphia and other northern cities are to be accounted for.

Complete development from the deposition of the egg to the emergence of the adult stable fly may take place in 19 days, or even in 14 days, according to some investigators.

The common American roach has been reared from the egg to the adult state in the insectary. Young hatching July 11 from an egg case received from Eagle Pass, Tex., reached the adult stage between March 14 and June 12 of the following year, indicating a period of nearly 12 months for complete development.

In 1881 Dr. Carlos Finlay, of Habana, proposed the theory that yellow fever, whatever its cause may be, is carried by means of a certain mosquito from man to man.

To aid in preventing roundworms in pigs, remove all litter and trash from the farrowing pens and thoroughly clean them with hot water, soap, and lye, and the vigorous use of shovel and brush.

Termites are not true ants, although they look much like them and live in large colonies made up of different forms. Termite damage is always hidden inside the wood. The termites which do the greatest damage

to buildings and their contents, especially by weakening the supporting timbers, are those which live in the ground and attack wood indirectly from the ground.

It is important in a fight against clothes moths to know something about their biology. Each generation is called a life cycle because the insect keeps passing through a successive round of stages, consisting of the egg, the larva, the pupa, and the moth. The following facts concerning these stages of the life cycle relate particularly to the webbing clothes moth, but must be taken into consideration in any intelligent campaign against clothes moths of other species as well.

In Panama a mosquito larvicide made as follows is being used: 150 gallons of carbolic acid is heated in a tank to a temperature of 212° F., then 150 pounds of powdered or finely broken resin is poured in. The mixture is kept at a temperature of 212°.

When animals are grossly infested and the ear canals packed full of ticks the parasites are visible on superficial examination, but when the degree of infestation is light or moderate the ticks may be overlooked.

Two species of small wasplike insects have been found to breed within the pupae of the stable fly. These insects deposit their eggs through the hard puparium, and instead of an adult stable fly the little parasite emerges.

A very practical test for controlling the bedbug was made in Ontario, Canada, adapting the method of control of insects infesting granaries and flour mills by superheating. In this instance an eight-room, two-story frame house, badly infested with bedbugs, was during the month of July brought to a very high degree of heat by making up good fires in the heating furnace and other stoves in the house and closing up the house to retain the heat. The eradication of the bedbug from this house was complete, and no damage was done to the house or its contents.

Though sudden heavy rains, especially when combined with low temperatures in winter, reduce the numbers of the Argentine ant, it has been found that it is only a question of months before the normal infestation is regained. Other forms of natural control are of still less importance.

Several species of flies are found commonly in houses. Some of them so closely resemble the true house fly that it requires very careful observation to distinguish them from it. One of these is the biting stable fly. It occurs frequently in houses and differs from the house fly in the important particular that its mouth parts are formed for piercing the skin. This fly is so often mistaken for the house fly that most people think that the house fly can bite.

Roaches may be controlled by the use of (1) poisons and repellents; (2) fumigants; and (3) trapping.

As with nearly all the insects associated with man, the bedbug has had the habits now characteristic of it as far back as the records run. It was undoubtedly of common occurrence in the dwellings of the ancient peoples of Asia. The Romans were well acquainted with it, giving it the name of Cimex. It was supposed by Pliny--and this was doubtless the common belief among the Romans--to have medicinal properties, and it was recommended, among other things, as a specific for the bites of serpents. It is said to have been first introduced into England in 1503, but the references to it are of such a nature as to make it very probable that it had been there long before. Two hundred and fifty years later it was reported to be very abundant in the seaport towns, but was scarcely known inland.

The principal effort to control this dangerous insect must be made at the source of supply--its breeding places. Absolute cleanliness and the removal or destruction of anything in which flies may breed are essential; and this is something that can be done even in cities. It is often necessary to catch or otherwise destroy adult flies, or to protect food materials from contamination and persons from annoyance or danger; hence the value of fly papers and poisons, flytraps, and insect screens.

In the final analysis the prevention of trichinosis is a personal responsibility and involves the thorough cooking of all pork. Pork products of kinds customarily eaten without cooking are also dangerous unless it is definitely known that such products were prepared in a plant operating under Federal meat inspection or equally thorough State or local supervision.

When properly used one application of the pine-tar-cottonseed-oil mixture is usually sufficient to kill all ticks in the ears of the animal at the time of treatment. It should be remembered, however, that the eggs of the tick are not deposited or hatched in the ears of the animal, and a new crop of seed ticks may find lodgment at any time on animals kept in infested places.

The different kinds of North American house ants may be grouped on the basis of origin as follows: (1) Tropical Old-World ants, represented by 12 species; (2) ants introduced from the New-World Tropics, represented by 5 species; (3) native North American ants of temperate regions which occasionally inhabit dwelling houses, represented by 2 species; and (4) such occasional garden and lawn ants as may from time to time become accidental house pests by extending their forays into dwelling houses in quest of food, of which 4 native North American species are discussed, and also the introduced European meadow ant.

The true house fly, which is found in nearly all parts of the world, is a medium-sized fly with four black stripes on the back and a sharp elbow in one of the veins of the wings. The house fly can not bite, its mouth parts being spread out at the tip for sucking up liquid substances.

Before feeding, the adult bedbug is much flattened, oval, and in color is rust red, with the abdomen more or less tinged with black. When engorged the body becomes much bloated and elongated and brightly colored from the ingested blood. The wings are represented by the merest rudiments, barely recognizable pads, and the simple eyes or ocelli of most other true bugs are lacking.

A weakly poisoned sirup gives better results than a strong poison, the workers carrying it to the nest and feeding it to the queen and the larvae, eventually exterminating the entire colony of Agrentine ants. A strong poison, however, is likely to act as a repellent. As the ants will continue to feed on a weakly poisoned sirup, it is desirable to place it in cans or paraffined paper bags <u>outside</u> of the infested house.

Flytraps may be used to advantage in decreasing the number of flies. Their use has been advocated not only because of the immediate results, but because of the chances that the flies may be caught before they lay eggs, and the number of future generations will be reduced greatly.

An experiment was made to determine the value of various chemicals used for the control of house flies. The results of the tests are shown in Table 1.

Table 1.--Quantity of a chemical and time required to kill five house flies in a I-liter flask at 70° F.

Chemical	Quantity of chemical required	Time required (average of five tests)	Chemical	Quantity of chemical required	Time required (average of five tests)
	Grams	Minutes		Grams	Minutes.
Carbon bisulphide	0.02179	400	Salicylic aldehyde	0.0044	93
Benzene	.02028	185	Ortho-nitrophenol	.001	241
Toluene	.01548	258	Ortho-bromtoluene	.00265	159
Chlorobenzene	.01265	85	Para-bromtoluene	.001	318
Brombenzene	.00475	133	Ortho-cresol	.00064	182
Phenol	.003	155	Meta-cresol	.00196	223
Iodobenzene	.00347	87	Para-cresol	.00193	249

1.9

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(23) The sweetfern grows in dry, sterile soil so frequently peopled by the poor pitch pines.

(24) Significant tendencies exist in urban and rural birth rates.

(25) Farmers who are operating poor land should be encouraged to find better opportunities in agriculture or other occupations. This will include land peculiarly subject to erosion.

Edit the material given below. Make all corrections on the copy.

1. By continuing the study further it would have answered the question as to whether or not the true ratio is 3:1 or 13:3.

2. Schedius kuvanae hibernates as an adult female and usually occurs in the forest debris; those that survive the winter appearing during the first warm days of April, and have been observed ovipositing during the latter part of this month on bright warm days.

3. The genetic assumption is that the contrasted characters, tall and dwarf, differ by two genetic factors: A dominant dwarfing (DD) factor and an inhibiting factor (II). When two varieties are crossed and dwarfs occur in the F_2 generation, it is thought that the one parent must carry both dominant factors, DDII; conversely, the other variety carries both recessive factors (ddii).

4. He found that the organism caused lesions over a wide range of temperatures of from 9° C to 27° C. He found that the optimum for pathogenicity was at 18° and at above 24° it was not a serious factor in disease production.

5. Similarly standardized cream secured from pasteurized milk was exposed to the same duration of time and degree of temperature.

6. Some of the fruit flies survive for longer periods of time than that covered by the host.

7. The Guernseys gained as much or more than the Jerseys.

8. Dripping wet, the trip around one of the inland lakes of the Philipines was abandoned by the students.

9. Sixty-five suspected cases of rabies were received and subjected to laboratory examination. Of these fifty-five were from dogs, of which 4 were positive. Of 7 cats one was positive. Of 1 calf and 2 rats, no positive cases were found.

10. This type of stock raising is not only the only possible one but may not be the most desirable one.

11. A resurvey was made of an area where a campaign was conducted the previous year.

12. Instead of five classes as is the case with mature beef, there are only four classes of yearling beef.

13. Within a few days past this newspaper has been reliably informed that in the past week several farmers in Jefferson county shipped three tons of carrots to Atlanta, the informant himself having shipped four tons of mixed vegetables, he saying also that "We got very good prices for all our vegetables and everybody made some money."

14. Cotton, butter fat, eggs, and lambs were worth less than half what these commodities brought 11 months earlier.

15. The quality decreased with the storage temperature below 50° F. and the time of storage.

16. Finally meal plans are suggested along with simple appetizing ways of serving the foods listed and getting full benefit from the leafy vegetables, fruits, tomatoes, and other "protective" foods.

17. Corrosive sublimate is very poisonous and must be handled accordingly.

18. During the year two portable motion-picture outfits were used to give 320 exhibitions, with a total attendance of 45,800 persons.

19. In some cases the pigs contracted the disease, in others there was no effect.

20. South Carolina vegetables have a higher iodine content than any other state in the union.

DISCRIMINATION IN THE USE OF WORDS

In correcting the following sentences (on this sheet where possible) consult the Style Manual of the Government Printing Office and Webster's Dictionary in regard to capitalization, hyphenation, orthography, and the use of figures and abbreviations, Make the sentences correct in every detail.

(1) Instead of the corn feeding experiment's being carried on longer at the Experiment Station it was decided to make trial of its application to a relatively small region for 1 year or two and then if it were successful to try it in a larger area.

(2) The fact that on one hand the experiments were started late and on the other hand that the weather was unfavorable were unfortunate.

(3) Hanson, reporting in 1925, finds the causal organism to be that shown in Fig.17. It will be seen that this organism was only one inch long and 1/10 of a inch wide.

(4) A Nationwide investigation was undertaken in cooperation with state experiment Stations to ascertain the relation of quantity and method upon the quality and yield of fruit.

(5) Maggot injury in the seedbed is usually first evident by certain plants' becoming of a lighter and more bluish color than the others.

(6) The application of carbon-disulfide into wholes about the crowns of plants were found to be unsuccessful in agreement with Swain and Gibson and Ross. The chemical was very toxic at lower applications.

(7) Five clinical cases were treated by intravenous injections with sodium carbonate, and five others were treated by intravenous injections with neutral acreflavine.

(8) These are rare found specimens, of which the equal has not been seen among these parts for many a year.

(9) Auction of one one year old heifer and 3 two-year old horses was held at two o'clock P.M. The auction lasted only 9 minutes, with everyone gone by 3 p.m.

(10) The eggs developed in from 1 too 2 weeks, the average being eleven days. At the end of the period there were from one to six fully-developed eggs and from nine to twelve partly developed eggs.

(11) The clerk opened the venetian blinds so that the customer might see to good advantage the Delf ware, which he said was almost as pretty in design if not prettier than the wedgewood ware enclosed in the cabinet.

(12) Designing of six hen houses in Baldwin Co, Georgia, one fish hatchery nearby Nevinsville, Adams Co., Ia., and the building of 3 fox farms adjacently to Cedar grove, in Sheboygan County, Wisc. was undertaken by the bureau of agricultural engineering of the U. S. department of Agriculture.

(13) When the last instar of one of these internal-parasitic larvae is reached there is very little liquid food left. Most of them had parts of some host organ projecting from the mount. In two generation host zones the larval development follows very closely the above rates, and the parasite has in normal years a total-larval period from six to ten days.

(14) In the tropics the materiel appointed the role of poisoning the fish was cube.

(15) The data on the growth of apples on branches that were not ringed but from which all of the leaves were stripped is presented in table 8

(16) Compared to the crops raised in the southern states those raised in dry land farms are very low. Per-acre timber yields in National Forests in the west exceeded those from private woodlots in the east.

(17) That the crop will be as large as possible every preventive precaution was applied.

(18) The reason why the crop flourished in that region subsequently to the invention of the cotton-gin was because its economical importance was increased.

(19) Based on the 14th cencus, the number of cows has increased rapid.

(20) Due to his firy temper, his way wouldn't be no bed of roses even if he was a millionnaire.

Edit the following copy. Cut, paste, and rearrange if necessary, but do not rewrite on other paper. Put your name on every sheet of this exercise. You are not responsible for facts. Assume that they are correctly given unless they are very obviously impossible.

In spite of many experiments, treated exhaustively in the present publication and conducted over a great many years at many and varied experiment stations and centers of research activity it has been demonstrated that because the country is so large and it has such wide differences in climatic and agricultural conditions, whereas within the various States or within smaller districts, areas, or localities, flexible rotations have been found to have been practicable under experimental conditions any kind of rotation that would be suited to all sections of the United States is out of the question. Cotton, corn, wheat, oats, and hay are to be regarded as the five major crops grown in the United States, each occupying more than 30,000,000 acres on American farms or 87.5 per cent of the total crop area of the Nation and suggesting , in theory, a 5-course national rotation.

Experiments have been made at Rothamstead, England, at Columbia, Mo., at Wooster, Ohio, at Urbana, Ill., and elsewhere. By crop rotation is

meant, in general, the growing of different kinds of crops in recurring succession on the same land. The Rothamstead studies which were included in the considerations upon which the presentations contained herewith are based, cover an impressively lengthy period of 72 years. The Missouri researches cover 30 years, the Ohio, 25, and the Illinois 14.

A complete commercial fertilizer is a compound of which it may be said to possess as its component constituents all three of the three major nutrient elements, that is, in other words, nitrogen, phosphorus, and potassium. In the light of the study that has been made of the value of crop rotation, it may well be assumed that on naturally productive soils a proper rotation may for many years prove more effective in maintaining yields than farm manure or single, mixed, or even complete commercial fertilizers.

As the yields of crops are dependent upon the productivity of the soil, changes in the productivity of the soil must ultimately be reflected in changes in the yields of crops. Excellent results along this line have been secured in considerable numbers of the experiments which have been conducted in the field of rotation of crops.

Crop rotation means, specifically, the growing of crops under a system

of cropping that involves the proper combination and production of different crops, one after the other, on the same land, and watching their effect on each other.

The idea of elasticity in the cropping system is not new. In fact, it long ago passed the experimental stage nor does it now require any demonstration for proof, for so long has it been recognized as a factor in successful farming that in all probability the farmers of Flanders applied this principle in their husbandry as early as the Middle Ages (476-1300 A.D.), if not prior to or during time of the Roman Empire. About 1600 A.D. English writers on husbandry referred to certain cropping schemes of the Flemish farmers, such as change of crops and adaptation of crops to soil conditions, as having been practiced by them from time immemorial. And, in 1645, Sir Richard Weston (Sir Richard Weston, The Husbandrie of Brabant and Flanders, in Hartlib's Husbandrie, 1654, p. 5.) on discovering the secrets that made possible the highly successful husbandry of the Flemings, gave such a definite expression of this principle of flexibility or of elasticity in cropping that his statement of it needs no modification to make it applicable as a guiding principle in successful soil management, even in our modern and

scientific age.

When the principles governing proper rotations are understood by a farmer, he is in a position to think through his cropping problems; and, being guided by principles, he is better able to establish on his fields systems of cropping that will mean higher and more permanent yields produced at lower acre cost. It is a a farm practice which may prove equally as effective or even more so than the use of manure or commercial fertilizers in maintaining and increasing the fertility of the soil.

This agriculturally important fact regarding the value of rotation in relation to production costs is worthy of the serious consideration of every American farmer.

Because of the lack of uniformity in conditions on individual farms, taking into consideration all farms, there are only a comparatively few farms having conditions favorable to permit of each being divided into a certain number of fields to accomodate a single, fixed rotation. The aim of this publication and the purpose of the discussion which follows are to emphasize the value of crop rotation in farming economy and to stress the principles of rotation in their relations to the maintenance of soil fertility and to soil improvement.

Editing Technical Material

Edit (on the copy) the material given below. Put it in suitable form for publication in the Journal of Agricultural Research. Remember that this article is written for specialists in the field treated. Arrange the material in logical order, and insert appropriate headings and subheadings. Delete any material that may be irrelevant. Correct any statements or conclusions that are shown by the context to be erroneous. Assume the statistical correctness of matter in tables and figures. The list of literature cited has purposely been omitted.

STUDIES AND FEEDING EXPERIMENTS WITH HONEY USING RATS AS THE EXPERIMENTAL ANIMALS

Honey has been considered a valuable food since times began. Consisting as it does of a mixture of dextrose and glucose it is easily eaten and digested, and this fact may account in part for the good results obtained when it is used in the diet, especially of growing infants. Since honey can be used to advantage in the human diet of infants, children, and adults, the question arose as to whether it might not be a source of some or all of the vitamins. A review of the literature revealed the fact that very little work had been done in the way of determining quantitatively the vitamin content of honeys and honeycombs.

Since it was out of the question to make an exhaustive examination of honeys of all the principal floral sources, and the flowers from all the honey-growing regions of the world, three samples representing the extremes of color variation were chosen for investigation and study. None of the honeys had been heated as is often the case with extracted honey. Honey No. 1 was a white-clover honey from Grover Hill, Ohio. This was in a granular state when received. Honey 2 was a buckwheat honey, very dark in color, produced near Varysburg, N. Y. 3 was a light-colored white-clover honey from Middlebury, Vt.

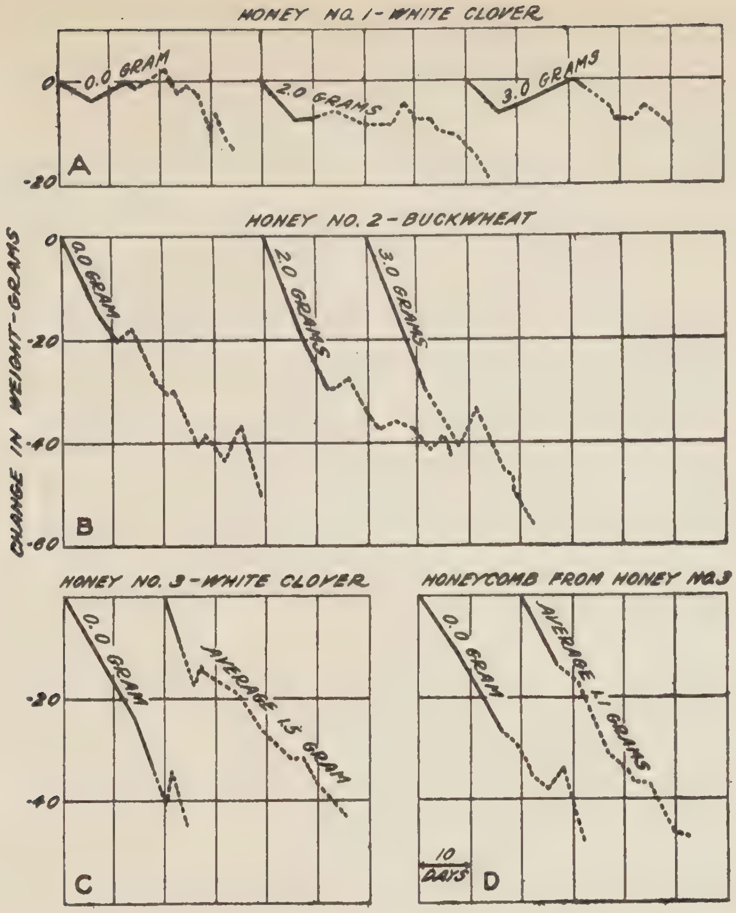

Figure 1. Changes in weight made during the test period by groups of rats fed honey or honeycomb as the sole source of vitamin A. Each curve is the average result of several tests. The amount of honey or honeycomb received by each rat six times per week is indicated on each curve.

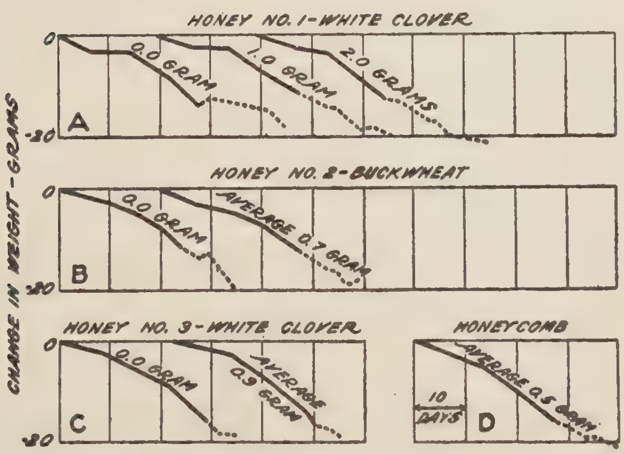

Figure 2. Curves showing changes in weight made during the test period by groups of rats fed honeycomb as the sole source of vitamin B. Each curve is the average result of several tests. The amount of honey or honeycomb fed to each rat six times per week is indicated on each curve. The change in weight for the group is represented by a solid line to the point where the death of the first animal occurred. The broken line represents the averages for the surviving animals until all had died.

It was drained from the comb and the comb was pressed as free from adhering honey as possible and was also used in feeding tests.

The method used for vitamin A determinations was essentially that of Sherman and Munsell with a few modifications.

The basal diet consisted of casein (purified), 18 per cent; starch, 67 per cent; brewery yeast, 10 per cent; Osborne and Mendel salts, 4 per cent; table salt, 10 per cent. The diet was irradiated with the light from a mercury vapor quartz lamp to insure an abundance of vitamin D. The rats were fed the vitamin-A-free diet until stationary or declining weight and appearance of symptoms due to vitamin A deficiency indicated that their body stores of vitamin A were depleted. As soon as the rats were in a suitable condition to be used for tests they were weighed and placed in individual cages. A weighed amount of the vitamin-A-free food was given to each rat and the honey was fed as a daily supplement to this diet.

Honey Nos. 1 and 2 were fed daily in amounts of 1, 2, and 3 gm. per day. The plan of feeding daily portions of honey to the rats required a great deal of time. For this reason honey No. 3 and the honeycomb were incorporated in the basal diet in place of 30 per cent of the starch in the diet. In each litter one or more animals were designated as controls and received only the basal diet during the test period. The test period was continued for eight weeks, or until it was officially terminated by the lamentable death of the rat. If the rat did not live out the eight weeks the last recorded weight is that of the deceased rat. Autopsies were performed on all animals to determine whether the gross pathological lesions shown by animals confined to a vitamin-A-free diet were present. Table 1 gives the weights and survival periods of the rats used for these tests and also records the pathological lesions found. Curves showing the changes in weight made by averaging re-

Table 1.—Weight records of rats fed honey and honeycomb as the sole source of vitamins A and C

WHITE-CLOVER HONEY (NO. 1)

Quantity of honey fed per rat per day, 6 days per week (grams)	Rat No.	Weight of rats at age of 4 weeks	Weight of rats	Successive weeks of test period 1	2	3	4	5	6	7	8	Period of survival
		Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams
	907	54	67	65	68	74	67	52	—	—	—	91
	922	50	65	62	63	71	54	50	—	—	—	84
	923	48	58	52	60	56	59	42	—	—	—	87
	937	51	66	64	68	78	77	54	—	—	—	84
0	968	61	80	83	98	86	71	—	—	—	—	74
	975	54	71	68	88	85	77	60	—	—	—	83
	993	59	88	92	85	84	77	66	—	—	—	79
	996	52	77	70	74	70	66	50	—	—	—	79
	1110	36	80	69	56	53	—	—	—	—	—	57
	1123	45	85	78	75	76	58	—	—	—	—	59
Average	—	—	—	—	—	—	—	—	—	—	—	77.7
	908	53	70	64	63	70	64	54	—	—	—	91
	921	46	55	53	51	57	53	45	—	—	—	91
	935	58	79	71	75	83	77	69	—	—	—	82
	972	56	61	53	49	—	—	—	—	—	—	59
2.0	974	54	70	67	82	83	79	66	55	51	—	93
	994	57	83	77	77	60	61	57	—	—	—	79
	1107	64	116	95	95	75	—	—	—	—	—	63
	1120	45	92	84	80	79	60	—	—	—	—	61
Average	—	—	—	—	—	—	—	—	—	—	—	77.4
	924	44	52	45	50	49	45	—	—	—	—	77
	925	42	50	45	48	52	44	36	—	—	—	84
	933	62	76	64	67	86	92	82	67	—	—	89
3.0	934	52	66	58	60	67	62	49	—	—	—	84
	971	57	67	62	81	84	70	59	—	—	—	81
	995	55	86	84	77	76	60	58	—	—	—	78
	1119	46	95	88	83	78	77	71	—	—	—	67
Average	—	—	—	—	—	—	—	—	—	—	—	80.0

BUCKWHEAT HONEY (NO. 2)

	1366	55	134	123	109	84	—	—	—	—	—	55
	1373	48	111	91	91	68	68	—	—	—	—	56
	1391	55	130	110	105	104	88	75	—	—	—	70
0	1396	52	120	96	98	96	65	—	—	—	—	65
	1404	57	136	125	127	112	109	100	85	—	—	74
	1405	58	124	113	121	105	77	—	—	—	—	63
	1415	59	139	123	100	—	—	—	—	—	—	48
	1420	54	111	109	95	73	—	—	—	—	—	56
Average	—	—	—	—	—	—	—	—	—	—	—	60.9
	1368	50	126	109	103	81	69	—	—	—	—	59
	1372	53	117	102	90	82	74	74	—	—	—	66
	1390	59	147	120	93	88	—	—	—	—	—	54
2.0	1393	55	115	103	95	94	98	76	72	—	—	74
	1403	61	157	125	115	95	94	—	—	—	—	57
	1407	56	118	97	109	100	82	67	—	—	—	67
	1417	52	119	104	80	—	—	—	—	—	—	49
Total	—	—	—	—	—	—	—	—	—	—	—	60.9
	1365	56	139	125	92	90	—	—	—	—	—	42
	1371	54	120	97	83	95	72	68	—	—	—	63
	1389	59	137	126	95	81	—	—	—	—	—	49
3.0	1392	49	126	94	99	94	80	68	—	—	—	69
	1402	63	153	135	107	89	—	—	—	—	—	54
	1406	57	126	96	103	90	77	—	—	—	—	62
	1414	61	132	121	111	91	—	—	—	—	—	58
	1418	51	123	106	81	—	—	—	—	—	—	48
Average	—	—	—	—	—	—	—	—	—	—	—	55.6

Table 1.—Continued

LIGHT-COLORED WHITE-CLOVER HONEY (NO. 3)

0--------	2908	58	114	102	93	80	---	---	---	---	---	65
	3086	57	131	108	95	79	---	---	---	---	---	65
	3089	52	114	105	93	80	69	---	---	---	---	69
	3092	49	110	105	92	70	---	---	---	---	---	65
Average -	-----	---	---	---	---	---	---	---	---	---	---	66.0
Average, 1.5 (30 per cent of diet)	2903	63	137	101	---	---	---	---	---	---	---	54
	2904	62	120	113	109	89						67
	2906	57	134	94	---	---	---	---	---	---	---	54
	2907	58	98	87	---	---	---	---	---	---	---	51
	2909	55	118	109	96	94	76	---	---	---	---	76
	2910	54	115	85	95	85	84	72	---	---	---	83
	2911	50	106	82	---	---	---	---	---	---	---	54
	3085	57	125	118	98	94	80	---	---	---	---	70
	3087	50	104	87	84	---	---	---	---	---	---	53
	3088	56	123	105	108	90	92	---	---	---	---	72
	3090	51	105	95	90	78	76	64	---	---	---	76
	3091	50	117	100	87	80	---	---	---	---	---	66
	3093	40	100	94	91	83	63	---	---	---	---	72
Average--	----	---	---	---	---	---	---	---	---	---	---	65.2

HONEYCOMB

0---------	3128	58	114	107	107	83	72	---	---	---	---	65
	3129	57	117	110	83	74	---	---	---	---	---	62
	3131	54	112	100	94	86	88	69	---	---	---	74
	3141	70	153	144	132	116	97	---	---	---	---	68
	3142	64	136	128	119	101	100	83	---	---	---	75
	3145	57	111	105	102	75	65	---	---	---	---	66
	3444	59	145	126	97	90	---	---	---	---	---	58
	3445	57	124	101	90	84	---	---	---	---	---	60
	3448	52	110	105	89	85	69	---	---	---	---	70
	3450	44	102	94	84	67	66	---	---	---	----	64
Average -	----	---	---	---	---	---	---	---	---	---	---	66.2
	3125	61	134	112	100	86	84	---	---	---	---	64
Average,1.[illegible] (20 per cent of diet)----	3127	59	122	110	107	86	72	---	---	---	---	70
	3130	56	114	105	92	78	74	---	---	---	---	67
	3132	47	106	96	82	63	---	---	---	---	---	59
	3144	60	130	119	96	95	84	76	---	---	---	73
	3143	54	111	107	94	74	---	---	---	---	---	62
	3146	57	117	110	92	---	85	70	---	---	---	76
	3446	55	120	80	---	---	---	---	---	---	---	49
	3447	52	114	95	86	---	---	---	---	---	---	53
	3449	52	103	100	85	79	65	---	---	---	---	67
Average -	----	---	---	---	---	---	---	---	---	---	---	64.0

Table 2.—Weight records of guinea-pigs fed honeycomb as the sole source of vitamin B

WHITE-CLOVER HONEY (NO. 1)

Quantity of honey fed per rat per day, 6 days per week (grams)	Rat No.	Weight of rats at age of 4 weeks	1	2	3	4	5	6	7	8	Period of survival
		Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Days
0	988	46	38	37	34	25	---	---	---	---	28
	1142	44	40	40	37	37	34	29	26	---	45
	1304	50	51	49	44	39	33	---	---	---	35
	1308	50	50	52	45	35	33	---	---	---	30
Average	---	---	---	---	---	---	---	---	---	---	34.5
1.0	985	51	49	46	39	32	---	---	---	---	28
	987	48	46	45	37	30	---	---	---	---	28
	1137	47	41	44	41	38	33	30	27	---	46
	1143	37	32	35	31	28	25	24	---	---	36
	1305	45	49	41	37	30	28	---	---	---	34
	1307	48	46	50	47	37	34	---	---	---	35
	1397	51	52	51	45	40	36	31	---	---	42
	1400	50	45	47	42	37	33	28	---	---	40
Average	---	---	---	---	---	---	---	---	---	---	36.1
2.0	986	45	44	45	37	30	---	---	---	---	25
	989	44	41	39	33	27	---	---	---	---	28
	1138	47	41	40	37	34	30	26	25	---	46
	1139	42	37	35	33	29	25	23	---	---	36
	1303	50	51	48	40	39	32	---	---	---	35
	1306	50	54	48	41	35	30	---	---	---	34
	1399	49	44	46	40	36	32	30	---	---	36
	1401	50	47	47	40	35	31	28	---	---	37
Average	---	---	---	---	---	---	---	---	---	---	34.6

BUCKWHEAT HONEY (NO. 2)

0	1961	45	41	41	36	30	26	---	---	---	34
	1968	41	40	36	31	25	---	---	---	---	26
	1972	41	39	37	33	27	---	---	---	---	28
	1985	35	34	31	27	25	---	---	---	---	24
	1989	32	32	29	26	21	19	---	---	---	30
Average	----	---	---	---	---	---	---	---	---	---	28.4
Average, 0.7 (30 per cent of diet)	1962	44	41	42	38	33	27	26	---	---	38
	1963	42	41	38	35	31	25	---	---	---	34
	1964	48	45	44	41	35	29	27	---	---	38
	1965	46	41	37	35	31	28	28	---	---	39
	1966	45	40	39	35	30	26	---	---	---	33
	1967	42	40	38	35	27	25	---	---	---	31
	1969	32	30	28	27	23	20	---	---	---	35
	1970	44	39	37	33	25	22	---	---	---	32
	1971	44	41	39	35	29	24	24	---	---	36
	1973	41	38	36	33	29	25	25	---	---	36
	1974	39	38	34	31	26	22	---	---	---	33
	1984	35	30	31	27	23	21	---	---	---	30
	1986	34	33	34	30	25	21	---	---	---	30
	1987	33	30	30	27	21	---	---	---	---	28
	1988	32	32	30	28	24	23	---	---	---	32
	1990	37	35	32	29	28	23	---	---	---	35
	1991	35	31	31	27	23	21	---	---	---	31
	1992	34	31	32	29	24	21	---	---	---	30
Total	----	---	---	---	---	---	---	---	---	---	33.4

LIGHT COLORED WHITE-CLOVER HONEY (NO. 3)

0	3010	49	49	45	41	34	30	---	---	---	31
	3014	45	46	43	38	32	27	---	---	---	31
	3015	45	45	42	36	31	29	---	---	---	30
	3072	52	50	48	40	36	32	---	---	---	32
	3075	52	48	44	43	38	33	28	---	---	38
	3079	45	41	38	38	30	29	---	---	---	29
	3081	45	41	37	36	30	26	---	---	---	31
Average	----	---	---	---	---	---	---	---	---	---	31.7
Average, 0.9 (30 per cent of diet).	3009	50	52	49	44	38	33	---	---	---	31
	3011	48	50	49	41	34	33	---	---	---	30
	3012	47	47	45	40	33	30	---	---	---	30
	3013	49	50	47	42	35	31	---	---	---	30
	3016	45	47	44	40	32	30	---	---	---	30
	3071	55	56	51	46	39	36	---	---	---	35
	3073	52	52	50	44	38	35	---	---	---	31
	3074	53	49	49	43	35	32	---	---	---	30
	3077	48	46	44	42	38	33	---	---	---	31
	3078	48	43	42	38	33	29	---	---	---	31
	3080	45	40	39	34	31	27	---	---	---	31
Total	----	---	---	---	---	---	---	---	---	---	30.9

HONEYCOMB

Average, 0.5 (20 per cent of diet)	3173	50	48	45	39	34	31	29	---	---	40
	3174	50	48	45	38	33	29	---	---	---	34
	3175	47	43	42	35	32	28	---	---	---	34
	3176	45	44	41	36	30	28	---	---	---	33
	3177	48	45	42	35	31	28	---	---	---	33
	3178	47	45	41	34	31	---	---	---	---	27
	3179	46	44	39	34	31	---	---	---	---	28
Average	----	---	---	---	---	---	---	---	---	---	32.7

sults from the groups of test animals are presented in Figure 1, A and C.

Few of the rats receiving the honey or honeycomb lived out the full eight weeks of the test period, though they lived on a weighted average longer than the control rats. The average period of survival of the rats fed no honey was 77.7, 60.9, and 66.0 days respectively. The average period of survival of the rats fed 2 gm. of honey per rat per day, six days per week was 77.4 days in the case of white-clover honey No. 1, 60.9 days in the case of light-colored white-clover honey No. 2, 68.2 days in the case of buckwheat honey No. 2, and 64 days when the honeycomb itself was fed. When white-clover honey No. 1 and buckwheat No. 2 were fed in larger quantities, or to the extent of 3 gm. per rat per day, six days in the week, the average survival period of the animals proved to be greater not only than that of the control animals but also of those fed only 2 gm. of honey per rat per day. While the feeding of light-colored white-clover honey No. 2 increased the survival period of the test animals this was not the case when the honeycomb was fed. In all cases the rats fed honey and honeycomb exhibited as severe pathological lesions as those that received no honey in addition to the basal diet.

These results indicate that no one of these three samples of honey contained an amount of vitamin A that could be detected by the method used for measuring this factor. The honeycomb, of course, contained vitamin A in considerable quantity.

The determination of the vitamin B content of the three samples of honey was completed before the multiple nature of vitamin B had been generally recognized. The method used was that of Sherman and Spohn, which makes no distinction between the two vitamin B factors. All rats were kept in cages having raised screen bottoms and were given a basal diet of casein (purified) 18 per cent, starch 68 per cent, butterfat 8 per cent, cod liver oil 2 per

Table 3.--Weight records and autopsy findings of guinea pigs receiving honey as the sole source of vitamin C

Guinea pig No.	Honey fed per 300 gm. of initial guinea pig weight	Weight of rat			Duration of experiment	Type of scurvy symptoms of autopsy	Autopsy findings[a]								Total of autopsy findings
							Bony system				Hemorrhages				
		Beginning	Maximum	Final			Jaw	Teeth	Ribs	Joints	Ribs	Intestines	Joints	Muscle	
	Grams	Grams	Grams	Grams	Days										
NO HONEY															
B 5-----	0	300	306	191	26	Severe-------	+++	+++	+++	+++	+++	++	+++	++	22
B 20-----	0	304	339	164	26	Very severe--	+++	+++	+++	+++	+++	+++	+++	+++	24
B 40-----	0	344	350	184	23	Severe-------	+++	+++	+++	-	+++	+++	+++	++	20
Average	-------	-------	-------	-------	25.0	-------------	----	----	----	----	----	----	----	----	22
HITE-CLOVER HONEY (NO. 1)															
B 11-----	1.32	310	310	227	20	Mild---------	++	++	++	++	-	-	Trace	Trace	9
B 37-----	2.78	347	359	196	28	Moderate-----	+++	+++	+++	+	Trace	-	+	do	12
B 13-----	2.86	378	397	244	27	Mild---------	+	+	+++	+	-	+++	++	+	12
B 39-----	2.90	350	390	249	31	Severe-------	++	+++	+++	++	++	++	++	+	17
B 38-----	3.19	340	352	194	26	-do -------	+++	+++	+++	++	+	+++	+++	++	20
B 35-----	3.28	402	406	206	27	Moderate-----	+	+++	+++	+	-	++	++	++	14
B 26-----	3.39	353	365	192	24	-do -------	++	++	+++	+	+	++	+++	++	16
B 7------	3.40	314	380	214	37	-do -------	+	++	+	++	Trace	++	+++	++	13
B 18-----	3.52	299	308	195	24	Severe-------	+++	+++	+	+	+++	Trace	Trace	Trace	11
B 14-----	3.67	321	373	233	28	-do -------	+++	+	+++	+++	++	do	+++	+++	16
B 16-----	3.70	296	311	164	26	-do -------	+++	+++	+++	++	+	+++	+	+++	19
B 1------	3.82	306	353	201	35	-do -------	+	++	+++	+	Trace	+++	+	+	12
Average	-------	-------	-------	-------	27.7	-------------	----	----	----	----	----	----	----	----	14 3
BUCKWHEAT HONEY (NO. 2)															
70-------	.74	414	428	252	29	Moderate-----	++	+++	++	+	-	+	++	+	12
71-------	.99	420	420	224	25	Severe-------	+++	+++	++	-	++	+++	++	++	17
67-------	1.04	419	420	298	21	Moderate-----	+	+	+++	+	++	+++	++	+	14
68-------	1.09	419	429	229	35	Mild---------	+++	+++	Trace	Trace	-	+	+	+	9
69-------	1.16	427	466	238	35	Severe-------	+++	+++	+++	+	++	++	++	+	17
64-------	1.20	413	443	243	32	- do -------	+++	+++	+++	+	++	+	++	+	16
63-------	1.63	413	413	249	21	Positive-----	++	++	+++	Trace	+++	+++	++	+	16
Average	-------	-------	-------	-------	28.3		----	----	----	----	----	----	----	----	14.4
LIGHT-COLORED WHITE-CLOVER HONEY															
75-------	.81	442	464	263	36	Severe------	++	+++	+++	++	+	+++	++	++	18
73-------	.84	443	472	245	33	-do ------	++	+++	+++	++	++	+++	++	++	19
76-------	1.20	453	461	291	29	-do ------	+	+	+++	+	+++	++	+++	+++	17
74-------	1.42	437	453	261	25	-do ------	+	++	+++	+	++	++	++	++	15
Average	-------	-------	-------	-------	30.8	-------------	----	----	----	----	----	----	----	----	17.3

[b] Intensity of scurvy symptoms is indicated by plus signs each having an arbitrary value of 1; minus signs indicate absence of symptoms

cent, Osborne and Mendel salts 4 per cent. Honey No. 1 was fed in amounts of 1, 2, and 3 gm. per rat per day. The other two samples were incorporated in the basal diet and replaced 40 per cent of the starch in the diet; the honeycomb replaced 20 per cent. The test period is usually eight weeks, but all of the animals used for these tests died before the end of the eighth week. The results are shown in Figure 3 and Table 3.

Only one of the honey samples and the honeycomb enabled the rats to live any longer or to make any greater gains in weight than the rats that received no additions to the basal diet. These results show that the honeys and honeycomb examined contained no vitamin B. This, of course, does not take into consideration the fact that vitamin B was subsequently found to be a complex.

The method for testing for vitamin D is identical with that described in a previous paper. Young rats approximately 60 grams in weight were placed on the Steenbock low phosphorus diet consisting of yellow corn, 76 per cent; wheat gluten, 20 per cent; calcium carbonate, 3 per cent; and sodium chloride, 1 per cent, fo
1 per cent, for 21 days, at which time they showed evidences of a rachitic condition. The honey was then fed during a test period of not less than 6 nor more than 15 days. At the end of the test period a line test was made according to the method described by McCollum. While this method may not be entirely satisfactory for quantitatively measuring vitamin D it seemed to us to be preferable to any other method worked out to date.

The three honeys tested were incorporated in the basal diet to the amount of 30 per cent, 10 per cent, and 20 per cent, respectively, and the honeycomb as 10 per cent. In each litter of rats used for testing honey No. 1 there was one or more control rats which were given 0.5 per cent cod-liver oil during the test period instead of honey. This plan of having positive

Table 4.--Summary of tests made to determine the vitamin D content of honey and honeycomb as compared with a cod-liver oil supplement

Test food in the diet	Duration of test period	Number of cases of rats	Average intake of honey per 100 gm. of rat per day	Average value of line test
WHITE-CLOVER HONEY (NO. 1)				
	Days		Grams	
	0	11	---	0
0	11	5	---	0
	13	6	---	0
	15	1	---	0
	11	13	2.36	0
	12	2	1.98	0
30.0	13	13	2.39	0
	15	1	2.49	0
COD-LIVER OIL				
0.5	9	15	0.04	4
	11	2	.04	4
BUCKWHEAT HONEY (NO. 2)				
	0	4	---	0
0	13	2	---	0
	15	4	---	0
	11	2	0.70	0
10.0	13	3	.67	0
20.0	15	3	.70	0
	13	2	1.45	0
	15	2	1.42	0
LIGHT-COLORED WHITE-CLOVER HONEY (NO.3)				
0	0	3	---	0
	15	3	---	0
20.0	13	12	1.49	0
	15	12	1.50	0
HONEYCOMB				
0	0	1	---	0
	13	1	---	0
10.0	9	3	0.80	0
	13	3	.79	

controls was not considered necessary in the tests with the other samples.

Summaries of the results of these tests are given in Tables 4 and 5. As all of the line tests with the honeys and the honeycomb were negative, the results with individual rats are not given. X-ray photographs were also made of the rats used in these determinations. These pictures as shown herewith check the line tests made on the corresponding rats in that all showed severe rickets. From these results it would seem that none of the honeys examined nor the honeycomb contained any amount of vitamin D that would cause calcium deposition in rats which had been maintained for 21 days on the Steenbock low-phosphorus-yellow-corn diet.

Dutcher determined the vitamin B content of honey obtained while basswood and white clover were in full bloom, using pigeons in his work. The tests were made by absorbing the citamin of the honey on Lloyd's reagent and feeding amounts equivalent to 45 gm. of honey. Nectar was tested in the same manner. Dutcher concluded that the strained honey contained a negligible amount of vitamin B and that there was little evidence of its presence in nectar.

In 1919 Bachman found that 25 c.c. of a strained honey added to 75 c.c. of water and used in Nagel's solution did not furnish the vitamin necessary for the growth of yeast.

Faber in 1920 made a study of the antiscorbutic value of a white-sage comb honey which was extracted before using. Guinea pigs used, and all of them exhibited characteristic scruvey symptoms when fed a solution of 1 part of honey to 15 parts of water, which was later increased to 1 part of honey to 5 parts of water. The quantity of honey consumed ranged from 0.88 to 5.58 c.c. of honey per 100 gm. of initial body weight. Faber concluded that it was "probable" that honey contained no antiscorbutic vitamin.

Hawk, Smith, and Bergeim determined the vitamin A, B, and C content of blended honey, white-clover honey, and honeycomb. For vitamin B their method consisted in feeding three groups of rats, respectively, (1) a diet free from vitamin B; (2) one in which blended honey replaced part of the starch; and (3) one in which white-clover honey replaced part of the starch. At the end of four weeks the diets were changed. Group 1 was divided and half the rats were given blended honey and the other half white-clover honey. After another two weeks all were given milk. From the results obtained, Hawk and his associates concluded that there was a small amount of vitamin B present in these honeys. Following a similar procedure for the vitamin A determination, they found that strained honey contained no vitamin A, whereas a definite but minimal amount was present in the comb honey. For the vitamin C test they fed three groups of guinea pigs in the same way; that is, they gave one group the scorbutic diet, a second group the same diet with blended honey to replace a part of the starch, and a third group the same diet with clover honey to replace the starch. All developed scurvy within two weeks, showing that the honeys contained no vitamin C.

In 1922 Luttinger gave a general report of his findings on the use of honey in infant feeding in which he states that he found vitamins A, B, C present in 82 per cent of the honey examined. No experimental evidence was presented to bear out this statement.

Smith in 1927 found vitamins A and B in corn syrup and C in maple sugar.

Scheunert, Schieblich, and Schwanebeck, in 1923, examined three samples of honey for vitamins A, B, C, and concluded that none of the samples contained vitamins.

Cathcart in 1929, reported that white clover honey could reasonably be expected to replace cereals in the diet of children.

Caillas, in 1925, reported work done with pigeons which seemed to show that fresh honey contained vitamin B. The number of birds used, however, was too small to make the results very convincing.

The method used to determine the vitamin C content of honey was that described by Sherman, LaMer, and Campbell. No tests were made on the honeycomb. The basal diet described by Sherman consisted of skim-milk powder heated at 510° C. for 4 hours, 30 per cent; a mixture of equal parts commercial rolled oats and wheat bran, 59 per cent; butterfat, 10 per cent; table salt, 1 per cent. The guinea pigs were somewhat heavier at the beginning of the test period than the standard animal described by Sherman, which was usually lighter in weight. Some difficulty had been experienced in other work in getting the smaller guinea pigs to eat the basal diet satisfactorily. In these tests the preliminary period was continued until it was ascertained beyond a doubt that the guinea pigs would eat the basal diet.

The honey was fed apart from the basal diet, and the test period was continued in each case until the guinea pig passed away. Honey is not relished by guinea pigs, no more than is spinach by most children, and the feeding required a great deal of time and patience.

The intake of honey was calculated as grams per day per 300 gm. of initial body weight. Table 3 gives the results of the feeding tests. For purposes of comparison each plus (-) under autopsy findings has been given a value of 1 and these have been totaled for each animal, i. e. for each guinea pig.

On an average the guinea pigs that had the honey did not live appreciably longer than those that had none. Before death and at autopsy all showed symptoms of scurvy that were as severe as the symptoms shown by the control animals. It is evident from these results that the three samples of

honey examined contained no appreciable amounts of vitamin C.

The three samples of honey examined were produced in widely separated localities and represented extremes of color variation. No detectable amounts of vitamins A, B, C, or D were found in any of the honeys or in the honeycomb.

It appears doubtful that honey would prove a good source of vitamin E. The authors plan later to undertake an investigation on the growth-promoting properties of honey as related to its iron, calcium and magnesium contents.

The pathological lesions found after death at autopsy of the rats fed honey and honeycomb as a sole source of vitamin A were very severe, and in some cases simulated those usually associated with vitamin E deficiency. The prevalence of black tongue in dogs and of pellagra in certain southern communities assumes added importance by reason of this finding. It was also observed that the guinea pigs fed honey as a sole source of vitamin C quickly contracted scurvy, showing symptoms of this disease at autopsy. It is interesting in this connection to remember that the juice of lemons and of limes was used more than a century ago to combat this dreadfully devastating disease among sailors. For this reason British sailors are still often called lime juicers, limeys, or limers.

The following 10 examples are submitted to test the student's knowledge and judgment of correct form in the preparation of tables. In each example are common mistakes which the student is expected to correct. Corrections should be made on the copy where possible, but if any table requires transposing new copy should be prepared. From the textual material the student will prepare a suitable table. The figures in all cases may be considered correct, so no time need be spent on verification.

Table 1 - Yields[1] of edible Sudan-grass hay per acre when cut at varying stages of maturity, 1928-29

Item of comparison	1928			1929			
	First heads out	Full head	Soft dough	First heads out	Full head	Soft dough	30 days
Yield per acre............pounds	3723	3911	3554	5172	4840	5131	3043
Amount refused by cows - per cent	19.7	34.0	30.2	15.8	30.4	18.3	16.5
Yield of edible hay per acre....................pounds	2990	2581	2481	4355	3853	4192	2541

[1] Air-dry basis

Table 2.--Capitalized total cost of open ditches, including maintenance, per 1,000 foot length.

Depth of cut	Excavation	Right-of-way width	Cost	Depth of cut	Excavation	Right-of-way width	Cost
	Cubic yards	Feet			Cubic yards	Feet	
6 feet.......	3,340	70	$1,131	12 feet.....	10,670	111	$3,089
7 feet.......	4,280	77	1,391	13 feet.....	12,280	119	3,512
8 feet.......	5,340	85	1,673	14 feet.....	14,000	125	3,959
9 feet.......	6,500	91	1,990	15 feet......	15,840	132	4,436
10 feet.......	7,780	98	2,332	16 feet.......	17,780	139	4,939
11 feet......	9,170	105	2,699	17 feet.......	19,840	146	5,468
				18 feet.......	22,000	154	6,025

Table 3.--Comparison of estimated long-distance motor-truck with rail and boat unloads of leading fruits and vegetables at five cities.

Long distance truck unloads	Car-lot rail and boat unloads from-- States originating truck unloads	Car-lot rail and boat unloads from-- All sources	Relation of truck unloads to total unloads from-- States originating truck unloads	Relation of truck unloads to total unloads from-- All sources	State of origin of truck unloads	City
Cars	Cars	Cars	Percent	Percent		
3,343	382	5,545	90	38	New York..........................	Buffalo....
266	255	7,035	51	4	Illinois, Indiana, Tenn., Mich.	Indianapolis
2,264	162	2,293	93	50	New York..........................	Rochester...
1,715	76	1,659	96	51	...do.............................	Syracuse....
847	1,204	15,599	41	5	Illinois, Missouri, Mich., Tenn..	St. Louis...
Total 8,435	2,079	32,131	80	21	....	....

Table 4.--Method of sale of fruits and vegetables from farms supplying New York markets as related to distance from New York.

Percent of sales	Distance from New York						
	1-5	6-10	11-20	21-40	41-60	61-100	Over 100
Through commission men	0	20.4	34.6	26.9	46.5	61.1	82.6
At Farmers' Markets	60.5	53	39.5	52.1	19.4	6.5	0.5
At farms	5.5	6.9	11.7	14.3	19.8	14.8	7.3
By other methods	34.	19.7	14.2	6.7	14.3	17.6	9.6

Table 5.--Gross volume per acre in board and cubic feet and percentage of rot for trees of all species 12 inches and larger in diameter breast high, grouped in 50-year age classes.

Age class (years)	Average age	Board feet	Cubic feet	Rot in -		Plots (basis)
				Board feet	Cubic feet	
	Years	Gross volume	Gross volume			Number
51 to 100.........	79	50,210	10,051	0.4	0.3	2
101 to 150........	117	93,750	15,808	1.4	.6	2
151 to 200........	184	145,530	23,226	7.4	3.8	4
201 to 250........	242	145,470	22,931	10.0	5.7	6
251 to 300........	273	185,720	28,956	12.6	6.7	2
301 to 350........	328	203,140	30,756	26.6	15.4	7
351 to 400........	383	92,530	14,606	11.2	6.8	1
401 to 450........	404	184,570	27,664	29.7	16.6	1
551 to 600	559	156,250	24,662	5.9	3.5	1

Table 6.--Cost in operation of equipment used for farm storage of bulk grain.

Item	Farm-storage plants				Gas engines	Farm elevating devices[5]
	Stationary		Portable			
	Wood	Metal	Wood	Metal		
Records....................number.	33	20	8	7	45	43
Distance to shipping point..miles.	5	6	7	11	-----	-----
Capacity..................bushels.	8,398	6,243	2,844	5,607	(4)	-----
Cost when purchased........dollars	1,374,08	740.00	258.00	646.40	128.97	159.78
Investment per bushel........do...	.16	.12	.09	.12	------	------
Age in 1929.................years.	13	8	5	9	6	7
Estimated total life.........do...	35	32	12	30	15	18
Cost, 1929, for--						
Depreciation[1]..........dollars	41.69	24.73	16.60	21.81	9.54	11.51
Repairs..................do...	2.09	1.61	1.25	-----	1.06	4.30
Insurance................do...	3.55	0.65	----	-----	-----	0.10
Gas, oil, and grease......do...	-----	-----	----	-----	14.13	-----
Interest[2]...............do...	52.72	33.02	7.86	27.61	4.78	6.07
Total..................do...	100.05	60.01	25.71	49.42	29.51	21.98
Amount chargeable to bulk-stored grain[3]..............do...	97.92	59.82	25.71	49.42	22.59	21.98
Cost per bushel stored in 1929.....................cents.	1.17	.96	.90	.88	.18	.18

1/ Straight-line depreciation was figured; a machine having an estimated life of 10 years would have a depreciation charge of one-tenth its original cost during each year of its life.

2/ 6 per cent interest was charged on the average value of the equipment in 1929.

3/ Only a portion of the year's expense on stationary storage plants and gas engines is chargeable to bulk-stored grain since these items were used for other purposes during the year.

4/ 12 per cent of these engines were under 3 horsepower in size; 71 per cent were 3-6 horsepower (6 horsepower being most common), and 17 per cent were over 6 horsepower in size.

5/ 70 per cent of the elevating devices were of the drag type, 18 per cent cup type, and 12 per cent blower type.

Table 7. -- Annual cost per acre of operating a nut orchard and yield required to cover costs

Item		Quantity per acre	Cost per acre
			Dollars
Labor and power prior to harvest			
Man labor	hours	26.0	6.82
Horse work	do	8.5	1.28
Tractor work	do	2.3	2.87
	Total	--	10.97
Materials			
Fertilizer at $37.50 per ton	pounds	570	10.69
Winter cover crop, vetch at 12¢ per lb.	"	20	.84
Miscel.		--	60
	Total	--	12.13
Other costs			
Taxes		--	.14
Use of machinery		--	90
Overhead		--	3.46
	Total	--	4.50
Total cost exclusive of interest		--	27.60
Interest at 6%		--	8.14
Total cost including interest		--	35.74
Quantity of nuts at 30¢ a lb. required to cover cost including harvest			
Exclusive of interest	pounds	103	--
Inclusive of interest	"	132	--

Table 8. -- Cost of preparing an acre of land for corn, 1860-1930.

Year	Spreading fertilizer	Plowing	Disking	Harrowing	Planting	Cutting and shocking	Husking
1860	2.40	2.75	--	1.25	.75	1.30	2.00
1880	2.80	3.00	--	1.25	.85	1.40	2.00
1900	3.00	3.20	.75	.60	1.00	1.75	2.50
1910	3.00	3.20	.80	.65	.50	2.00	3.00
1930	3.50	2.50	.90	.40	.75	2.50	3.25
Total	14.70	14.45	2.45	4.15	3.85	8.95	12.75

Table 9.--Statistical summary of results of cooperative extension work, 192-

Item	Reported by county agents		Reported by home demonstration agents		Reported by club agents[1]		Total	
	Agents reporting	Project or line of work	Agents reporting	Project or line of work	Agents reporting	Project or line of work	Agents reporting	Project or line of work
	Number	Number	Number	Number	Number	Number	Number	Number
Farm visits made	2,238	1,200,181	180	38,481	119	42,374	2,537	1,281,036
Different farms visited	2,090	569,698	176	18,053	108	22,136	2,374	609,887
Home visits made	953	163,084	906	234,372	95	22,575	1,954	420,031
Different homes visited	928	89,683	880	120,623	86	11,826	1,894	222,132
Office calls	2,216	3,374,761	907	556,137	121	55,010	3,244	3,979,908
Percentage of time in field	2,234	66	919	69	131	64	3,284	67
Percentage of time in office	2,237	34	919	31	131	36	3,287	33
Demonstration meetings	2,019	110,191	820	123,614	120	11,422	2,959	245,227
Attendance at demonstration meetings	2,023	2,720,660	799	2,376,721	120	201,063	2,942	5,298,444
Soils								
Adult demonstrations	1,466	34,502	1	10	4	38	1,471	34,550
Farms following advice in use of commercial fertilizer	1,518	169,618	2	125	4	316	1,524	170,059
Farms using lime and limestone on advice	1,280	63,702	--	--	1	17	1,281	63,719
Rodents:								
Adult result demonstrations	150	1,545	7	156	--	--	157	1,701
Pounds of poison bait used	141	129,929	3	24	--	--	144	129,953
Marketing:								
Membership in cooperative marketing association	469	818,254	86	38,894	--	--	555	857,148
Value of products marketed	489	295,986,825	91	1,707,515	--	--	580	297,694,340
Value of supplies purchased	320	42,924,560	18	45,012	--	--	338	42,969,572

[1]Includes a small amount of work in counties without extension agents, reported by State club leaders.

Construct Table 10 from the following!

Seeds of Ribes americanum and Ribes cynosbati were collected on August 31 and September 3, 1924, and divided into lots of 100 seeds which were sown on September 15, 1924, and March 5, 1925. 202 days later the seeds of R. americanum in lot A showed a germination of 74 per cent, and 264 days after sowing the germination was 74 per cent, which was the percentage of total germination. The seeds of lot B showed a germination of 5 per cent at 182 days, 13 per cent at 221 days, 29 per cent at 332 days, and 35 per cent at 576 days. The total germination was 35 per cent. Seeds of R. cynosbati of lot A sown September 15 showed 79 per cent at 228 days, 84 per cent at 290 days, and no more germinated; of lot B, 144 days after sowing 7 per cent had germinated, 247 days after sowing 25 per cent had germinated, and the final count at 633 days showed 26 per cent. Lots C sown March 4, 1925, showed 2 per cent germination of R. cynosbati at 42 days, 2 per cent of R. americanum at 93 days and 16 per cent at 432 days, 7 per cent of cynosbati at 462 days, and a total germination of only 7 per cent of each lot and species. Only 1 per cent of the seed of lot D of Ribes americanum sown March 4, 1925, germinated in 93 days and 7 per cent in 432 days; 13 per cent of cynosbati germinated in 42 days and 19 per cent in 462 days.

ILLUSTRATIONS AND LEGENDS

1. Hand in one or more bulletins, circulars, or similar publications, which contain an illustration and also a legend which you consider faulty, and give your reasons in detail on a sheet attached to the printed matter.

2. From the following data construct graphs that will show the desired relationships clearly and most appropriately.

A. One of the tomato diseases develops spots on the fruits. The spots enlarge more rapidly on ripe than on green fruit, as shown by experiments the results of which are here given. At the beginning of the experiment the tomatoes were separated into three lots -- ripe tomatoes, nearly ripe tomatoes, and green tomatoes. The tomatoes in each lot were separated further into lots on the basis of size of spots on the fruits. The diameters chosen for the classification were 0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, and 5.0 millimeters. At the end of the experiment it was found that the spots had increased in diameter as shown below:

Diameter of spots at beginning of experiment	Increase in diameter of spots on ripe fruits	Increase in diameter of spots on nearly ripe fruits	Increase in diameter of spots on green fruits
Mm.	Mm.	Mm.	Mm.
0.0	0.29	0.18	0.12
0.5	.27	.17	.11
1.0	.24	.15	.09
1.5	.22	.12	.08
2.0	.21	.11	.07
2.5	.19	.10	.06
3.0	.17	.09	.05
3.5	.16	.08	.04
4.0	.14	.06	.03
4.5	.13	.05	.02
5.0	.12	.04	.01

B. An experiment was conducted to determine the temperature of the bark on the north side of some western yellow pine trees as contrasted with the temperature of the bark on the south side of the same trees. The following data were obtained.

Time at which temperature was taken	Temperature on North side °F.	South side °F.
10 A.M.	43	50
11 A.M.	45	58
12 M.	57	66
1 P.M.	58	72
2 P.M.	59	75
3 P.M.	56	60
4 P.M.	48	52

3 . The octavo-size publications of the Department allow for a maximum size of 4 1/8 x $7\frac{1}{2}$ inches for illustrations, including space for legends. Assume that one-half inch will be required for the legends in the following examples, whether the illustrations are placed narrow or broad. Mark each of the illustrations here given for reduction or enlargement so that one side will be maximum width or length and at least one half inch be left on the other side for the legend.

Problem: What will be the other dimension in each case ?

Illustration 1	-	5 x 7 inches
Illustration 2	-	8 x 16 3/4 inches
Illustration 3	-	$2\frac{1}{2}$ x 6 inches
Illustration 4	-	$3\frac{3}{4}$ x $5\frac{1}{2}$ inches

4. Edit the following legends according to the Department style.

Fig. 1: -- Plows used on the experimental Farm -- a: disk plow.

b. Sulky Plow; C, moldboard Plow.

Figure 2 -- : Roots of plants after they were exposed to the air:

Natural Size; A: Corn roots as they appeared 24 hours after exposure:

No root hairs developed on them. b.--wheat roots 2 days after exposure.

X 5.

Fig. 3. -- a: cross section of maple stem. B. -- longitudinal section of Maple Stem; c; Radial section of oak Stem.

Figure 4, A. -- The experimental plots as they appeared when the work was begun. Seventy plots were used. b: the wheat of five varieties grown on the plots. The photograph was taken just before harvest. Photographed by the Jones Photo Co.

The following tables, textual material, and graph are to be edited for statistical accuracy only. No attention need be paid to the English or to the box headings, etc.

In Table 3 it is obvious that certain items can not be checked; namely, valuation of farm, receipts, expenses, and value of farmer's labor. It is unnecessary to take time to check the averages for 1916-1920 and 1916-1921. They may be assumed to be correct. All other figures in Table 3 and all in the other tables involving computations, together with textual statements, should be carefully verified.

No checking is to be done in Table 5. It is presented merely as a means of checking Figure 1.

Corrections should be made directly on the copy supplied.

TABLE 1.--Dates of last frost in spring and first frost in fall, and number of frost-free days for the five years from 1920 to 1924, inclusive

Year	Last frost in spring	First frost in fall	Frost-free period (days)
1927.	Apr. 15	Sept. 27	166
1928.	May 13	Sept. 23	134
1929.	Apr. 23	Oct. 11	165
1930.	May 9	Sept. 30	145
1931.	May 15	Oct. 3	141
Average	May 6	Sept. 29	148

The frost-free period in 1931 was 17 per cent shorter than that in 1927 but 6 per cent longer than that in 1928.

TABLE 2.-- Average yield of hay

Plot No.	Acres	Average yield per acre
	Number	Tons
1	9	1.30
2	4	1.52
3	7	1.68
4	8	1.45
5	12	1.15
Average	8	1.40

TABLE 3.--Summary of the farm business on 50 orchard farms, 1916-1921

Item		1916	1917	1918	1919	1920	Average 1916-1920	1921	Average 1916-1921
Valuation of farm.	Dollars	30,505	30,735	30,732	40,662	46,306	35,788	43,253	37,032
Receipts	do	9,980	6,429	11,959	9,999	12,717	10,217	2,017	8,850
Expenses	do	4,536	3,430	6,299	5,506	10,153	5,985	3,035	5,493
Farm income 1/.	do	5,444	2,999	5,660	4,493	2,564	4,232	-1,013	3,357
Interest on valuation at 5% .	do	1,552	1,537	1,536	2,033	2,315	1,789	2,163	1,852
Labor income 2/.	do	3,892	1,462	4,124	2,360	249	2,443	1,145	1,506
Return on valuation 3/. . .	per cent	15.4	7.3	15.6	.9	3.4	9.4	- 4.4	6.8
Value of farmer's labor. . .	dollars	743	753	871	922	967	851	871	854

1/ Farm income - the difference between receipts and expenses.
2/ Labor income - the amount the farmer has left for his labor and management after 5 per cent interest on the farm valuation is deducted from the farm income.
3/ Per cent return on farm valuation is obtained by deducting what the operator considers his time worth from the "farm income", and dividing this balance by "farm valuation".

Note. Minus sign (-) before any figure indicates a loss.

Average receipts per farm during the five years, 1916-1921, inclusive, ranged from 12,177 in 1920 to $2,017 in 1921. Expenses during the same period ranged from $10,153 in 1920 to $3,053 in 1921.

A comparison of the returns for 1920 and 1916 shows that receipts increased at a higher rate than did expenses, receipts in 1920 being 27 per cent greater than in 1916 and expenses 24 per cent greater. As a consequence, farm income was greatly decreased, being but 53 per cent of that in 1916. The average farm income for the years 1916-1920 was 2.6 per cent greater than was the average for the years 1916-1921.

In 1921 receipts dropped to 84 per cent below those in 1920. Expenses likewise dropped, though not so much - 70 per cent.

The high points in both receipts and expenses were reached in 1920. Receipts that year were 630 per cent of the receipts in 1921 and expenses were approximately 235 per cent of those in 1921.

TABLE 4--Winter and summer feed costs for steers 1922-3 to 1924-5, inclusive

Lot	Total gain per steer 3 years (pounds)	Cost of feed per steer							Cost of feed per 100 lbs. gain	Pounds of gain per $100 feed cost
		Winter 1922-23	1923 Summer	Winter 1923-24	Summer 1924	Winter 1924-25	Summer 1925	Total		
A	815	$8.24	$7.08	$12.48	$12.05	$15.33	$14.10	$69.28	$8.50	1173
B	842	9.00	7.08	12.48	12.05	15.33	14.10	70.40	8.36	1220
C	904	13.25	7.08	12.65	12.05	15.33	14.10	79.64	8.80	1238
D	828	8.42	7.08	11.61	12.05	15.33	14.10	68.59	8.32	1207
E	877	8.10	7.08	11.61	12.05	15.33	14.10	68.72	8.73	1235
F	912	17.80	7.08	11.61	12.05	15.33	14.10	77.97	8.55	1170

TABLE 5--Number of larvae found in field, 1928, 1929, 1930

Month	1928	1929	1930
May	18	14	10
June	17	16	8
July	25	19	12
August	28	20	13
September	22	21	10
October	19	18	16
November	18	19	18
December	17	14	20

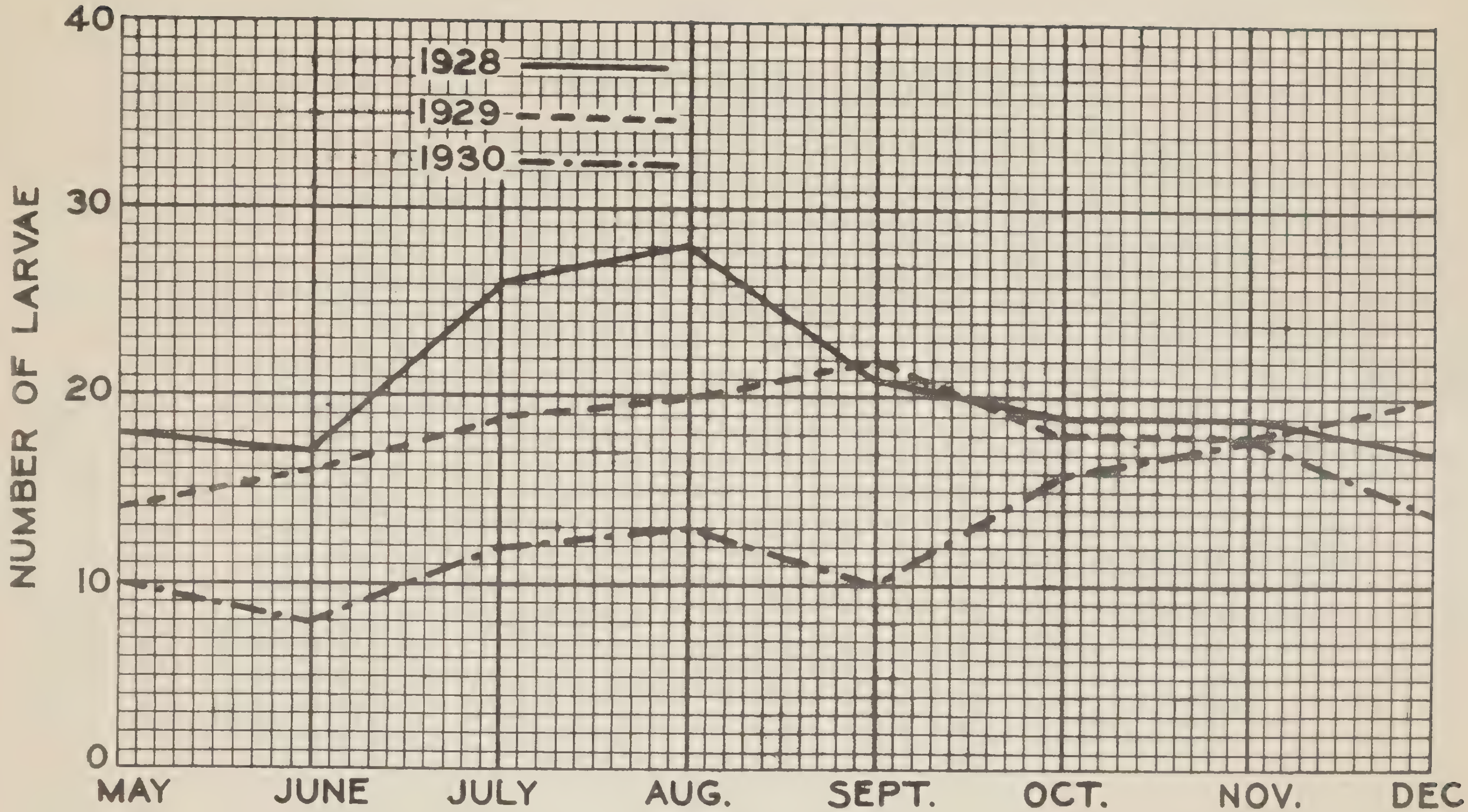

FIGURE I. — NUMBER OF LARVAE FOUND IN FIELD

CROSS REFERENCES--<u>See</u> and <u>See</u> <u>also</u>

1. <u>See</u> refers from a possible heading under which the references are given to the chosen heading where they may be found:

    Swine. <u>See</u> Hogs.

    <u>See</u> references may be divided as follows:

    a. From a subject heading under which reader might reasonably expect to find material to the heading chosen:

        Zebu cattle. <u>See</u> Cattle, Brahman.

    b. From a scientific to a popular name:

        <u>Medicago</u> <u>sativa</u>. <u>See</u> Alfalfa.

    c. From a popular to a scientific name:

        Alfalfa. See <u>Medicago</u> <u>sativa</u>.

    d. From a word not spelled in accordance with the Style Manual or department usage, to the approved form:

        Gypsy moth. <u>See</u> Gipsy moth.
        Live stock. <u>See</u> Livestock.
        Potatoes, sweet. <u>See</u> Sweetpotatoes.
        Syrup. <u>See</u> Sirup.

2. <u>See</u> <u>also</u> connects headings which represent allied subjects:

    Slaughtering. <u>See</u> <u>also</u> Butchering.

    <u>See</u> <u>also</u> references connect:

    a. Class and specific headings:

        Rodents. <u>See</u> <u>also</u> Gophers; Mice; Prairie dogs; Squirrels.
        Beverages. <u>See</u> <u>also</u> Coffee; Milk; Tea.

    b. A subject with its subdivisions:

        Botany. <u>See</u> <u>also</u> Cytology; Ecology; Histology; Pathology; Taxonomy.

    c. Headings which are related or contain allied matter:

        Laws. <u>See</u> <u>also</u> Legislation.
        Hunting. <u>See</u> <u>also</u> Game.
        Slaughtering. <u>See</u> <u>also</u> Butchering.

3. The words "see" and "see also" must be in italic in indexes only. Set "see" and "see also" in roman when they precede italic words. (Style Manual, p. 49.)

FILING

1. Arrange cards in alphabetical order--by first words, letter by letter; then by second words, letter by letter, etc.

   Black rot, apple
   Black stem rust, barley
   Blackberry diseases
   Blackbird, study

2. Dates precede words.

   Rust control
   Rust control, 1911
   Rust control, 1912
   Rust control, and eradication
   Rust control by spraying

3. Figures are filed as if spelled out.

   Pine, cork
   Pine, 5-needled
   Pine, jack
   Pine, white

   Clubs, boys and girls
   Clubs - 4-H
   Clubs, poultry

4. File prefixes S. and St. as if written out.

   Sable, protection laws
   St. Louis, milk laws
   Sales, cattle, at Chicago.

5. File cross references at the end of the subject if general, or, if specific, at end of modification to which they refer.

   Poultry, marketing. <u>See</u> Marketing, poultry.
   Poultry. <u>See also</u> Chickens.

6. In a large index it is often expedient to combine singular and plural entries.

   Apple (s)
   Blackberry (ies)
   Fly (ies)
   Potato (es)

7. When the same word serves for several kinds of heading, the order should be: Person, place (cities before States), subject.

   Cotton, John
   Cotton (City), Alabama
   Cotton, acreage

   Washington, Booker T.
   Washington (D.C.) or (City)
   Washington (State)

The following represent part of a larger index. The various entries are supposed to be separate slips roughly alphabetized under the initial letter only. Arrange in alphabetical order on another sheet of paper, and prepare them for the printer in accordance with instructions.

<u>Agrotis</u> <u>ypsilon</u>, life history and control.

Beattie, James R.: "Greenhouse tomatoes."

Blight. <u>See</u> <u>also</u> <u>under</u> <u>specific</u> <u>host</u>.

Beattie, W. R.: "Muskmelons."

Carpets, old, utilization.

Chestnut blight, occurrence and control.

Cutworms. <u>See</u> <u>Agrotis</u> <u>ypsilon</u>.

Carpet grass, harvesting.

Horse, use on farm.

Horses, breaking and training.

Hickory (cloth), definition and uses.

Hickory, growth in different regions.

Insects, carpet beetles, description.

Lee, Alfred R.: "Care of baby chicks."

Lee, A. R.: "Care of mature fowls."

Mouse. <u>See</u> Mice.

Mice, poisoning, directions.

Mouse, control in field and orchard. James Silver.

Tomato blight, control measures.

Windbreaks, farm asset.

Washington, game laws for 1930.

Wind, movement, effect of windbreaks.

Washington, fur laws for 1930.

Washington, Thomas H.: "Hog cholera."

Washington (City), milk supply.

LITERATURE CITATIONS AND BIBLIOGRAPHIES

The following citations are taken, for the most part, from manuscripts submitted by the bureaus of the Department of Agriculture and by the State agricultural experiment stations for publication in the department series of publications.

The list should be so arranged that the authors' names are in proper alphabetical order, which may be indicated by numbering the citations. Each citation should be corrected for errors in arrangement; omissions should be indicated; any misspelled words corrected; and any unnecessary information should be deleted. It may be assumed that the information given is correct, and it will not be necessary to check by comparison with the original publications.

For the benefit of those who do not have access to Department Bulletin 1330, Abbreviations Employed in Experiment Station Record for Titles of Periodicals, a list of all the necessary abbreviations is included.

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Abbreviations for Single Words

Agr. - Agriculture, Agricultural, Agricole, Agrarie.
Amer. - America, American, Americana, Americaine.
Ann. - Annual, Annals, Annale, Annuaire, Annuario,
Biol. - Biology, Biological, Biologia, Biologique.
Bul. - Bulletin, Bullettino, Buletinul.
Chem. - Chemist, Chemistry, Chemical, Chemie, Chemisch.
Dept. - Department, Departmental, Department, Département, Départemental.
Engin. - Engineer, Engineering.
Expt. - Experimental, Experiment, Experimentelle, Expérimentale.
Fla. - Florida
Geogr. - Geography, Geographic, Geographical, Geographers, Géographie, Geographisch.
Geol. - Geology, Geological, Geologist, Géologie, Geologisch.
Jour. - Journal
Mus. - Museum, Musée, Musei, Museo.
Natl. - National, Nationale
Rpt. - Report,
Rev. - Review, Revue, Revised, Revista.
Sci. - Science, Scientific, Scientifique, Scienze.
Soc. - Society, Societé, Sociedad, Soceità, Societas.
Sta. - Station, Stationen, Stantsii, Stantsiia.
Trans. - Transactions.
U. S. - United States.
Wyo. - Wyoming.

1.9 Ex 4 ..

Edit the following copy. Cut, paste, and rearrange if necessary, but do not rewrite on other paper. Put your name on every sheet of this exercise. You are not responsible for facts. Assume that they are correctly given unless they are very obviously impossible.

In spite of many experiments, treated exhaustively in the present publication and conducted over a great many years at many and varied experiment stations and centers of research activity it has been demonstrated that because the country is so large and it has such wide differences in climatic and agricultural conditions, whereas within the various States or within smaller districts, areas, or localities, flexible rotations have been found to have been practicable under experimental conditions any kind of rotation that would be suited to all sections of the United States is out of the question. Cotton, corn, wheat, oats, and hay are to be regarded as the five major crops grown in the United States, each occupying more than 30,000,000 acres on American farms or 87.5 per cent of the total crop area of the Nation and suggesting , in theory, a 5-course national rotation.

Experiments have been made at Rothamstead, England, at Columbia, Mo., at Wooster, Ohio, at Urbana, Ill., and elsewhere. By crop rotation is

meant, in general, the growing of different kinds of crops in recurring succession on the same land. The Rothamstead studies which were included in the considerations upon which the presentations contained herewith are based, cover an impressively lengthy period of 72 years. The Missouri researches cover 30 years, the Ohio, 25, and the Illinois 14.

A complete commercial fertilizer is a compound of which it may be said to possess as its component constituents all three of the three major nutrient elements, that is, in other words, nitrogen, phosphorus, and potassium. In the light of the study that has been made of the value of crop rotation, it may well be assumed that on naturally productive soils a proper rotation may for many years prove more effective in maintaining yields than farm manure or single, mixed, or even complete commercial fertilizers.

As the yields of crops are dependent upon the productivity of the soil, changes in the productivity of the soil must ultimately be reflected in changes in the yields of crops. Excellent results along this line have been secured in considerable numbers of the experiments which have been conducted in the field of rotation of crops.

Crop rotation means, specifically, the growing of crops under a system

of cropping that involves the proper combination and production of different crops, one after the other, on the same land, and watching their effect on each other.

The idea of elasticity in the cropping system is not new. In fact, it long ago passed the experimental stage nor does it now require any demonstration for proof, for so long has it been recognized as a factor in successful farming that in all probability the farmers of Flanders applied this principle in their husbandry as early as the Middle Ages (476-1300 A.D.), if not prior to or during time of the Roman Empire. About 1600 A.D. English writers on husbandry referred to certain cropping schemes of the Flemish farmers, such as change of crops and adaptation of crops to soil conditions, as having been practiced by them from time immemorial. And, in 1645, Sir Richard Weston (Sir Richard Weston, The Husbandrie of Brabant and Flanders, in Hartlib's Husbandrie, 1654, p. 5.) on discovering the secrets that made possible the highly successful husbandry of the Flemings, gave such a definite expression of this principle of flexibility or of elasticity in cropping that his statement of it needs no modification to make it applicable as a guiding principle in successful soil management, even in our modern and

scientific age.

When the principles governing proper rotations are understood by a farmer, he is in a position to think through his cropping problems; and, being guided by principles, he is better able to establish on his fields systems of cropping that will mean higher and more permanent yields produced at lower acre cost. It is a a farm practice which may prove equally as effective or even more so than the use of manure or commercial fertilizers in maintaining and increasing the fertility of the soil.

This agriculturally important fact regarding the value of rotation in relation to production costs is worthy of the serious consideration of every American farmer.

Because of the lack of uniformity in conditions on individual farms, taking into consideration all farms, there are only a comparatively few farms having conditions favorable to permit of each being divided into a certain number of fields to accomodate a single, fixed rotation. The aim of this publication and the purpose of the discussion which follows are to emphasize the value of crop rotation in farming economy and to stress the principles of rotation in their relations to the maintenance of soil fertility and to soil improvement.

Due Oct. 26, 1934.

Edit the material given below. Make all corrections on the copy.

(1) After distilling off the solvent the flasks were dried for four hours in an air oven at 100 degrees centigrade, cooled in dessicators and weighed.

(2) Upon arrival at the laboratory the berries were graded into eight, 10 and 15 lots on the basis of size, if the quantity of material available permitted and if the range in size of fruit was sufficient to permit such separation.

(3) While the aggregate losses of 6,000 chicks were reported principally by large customers, the small owners, or rather those who brooded in small lots or batteries, apparently had better luck.

(4) Horse bots exert a constant drain upon the vitality and condition of horses and mules and in the adult stage cause serious annoyance to them while laying eggs.

(5) The symptoms of infection on these beans were similar to the above peas.

(6) The sheets of tin were laid in rows and care is taken that all of the sheets fit snugly.

(7) Lead is heavier than any metal.

(8) The field work was conducted in Florida chiefly at the U. S. Horticultural Field Laboratory at Orlando, from February to June 1930, and was done in conjunction with similar studies of Sphaceloma fawcettii Jenkins, causing scab of citrus (Citrus) with which S. perseae was formerly believed to be identical.

(9) While the organism grows well as low a as 18° the maximum growth occurred at 25° to 30°.

(10) The tree was in the neighborhood of two thousand years old when it was felled by lumbermen.

(11) The efficacy of the sprays can only be determined by actual tests.

(12) Water absorbed at the surface percolates downward until the zone of saturation is reached.

(13) The operation of an incubator is simple, but no machine will work well unless it is watched.

(14) As previously noted, the peridia of the inbred Spacelotheca sorghi parent were reddish brown in color as contrasted with the gray color of the S. cruenta parent.

(15) The occurrence of the fungi in these areas was not unexpected and corroberates previous investigations by McNamara and Hooton.

(16) When the sorghum was harvested and the stubble plowed up numerous fungal strands were found intermingled with the sorghum roots which proved to be viable through germination tests.

(17) He is one of those men who disapproves of every new idea.

(18) North of the barn was a large field, and in which apple trees were planted.

(19) First the tripod must be set firmly; then remove the pins so as to allow the telescope to turn freely.

(20) Hog cholera is working havoc among the farmers of the vicinity.

(21) After a long drive they reached a clearing, immediately before them lay a large cultivated field.

(22) The scientists studied this phenomena carefully and accumulated much data relating to it.

(23) The sheets made into pipes by this method go through a very different process than in the preceding method.

(24) The government could then put on the relief rolls any men who they saw fit.

(25) It is during the first period that cultural practices and seasonal conditions affect the size of the nuts, while during the second period the degree to which the nuts are filled is determined by the cultural treatments used and the weather conditions that prevail.

Due October 19, 1934.

WORD FORMS

Use the Style Manual of the United States Government Printing Office (March 1933 edition), Webster's New International Dictionary, your knowledge of grammar and rhetoric, and common sense in correcting, on these sheets so far as possible, the capitalization, spelling, compounding, use of abbreviations, numerals, and punctuation, and diction in the following sentences.

1. Originally planned for Southern conditions where a circulator heater placed in the Hall should be adequate these plans will be adopted to colder regions if well constructed and provided with basements and central heating plants as indicated on the working drawings.

2. The testimony on the part of the Govt. was that of the 217 Cases collected as samples from the ship, in question 35% to 42% of the cans so collected contained decomposed fish

3. The total mileage for all classes of roads on which federal expenditures were made was $26,929.2 miles. The amount of Federal funds these projects will involve including those in National Forests , will not be known until the balance of the Fiscal Year has elapsed. Federal roads play an important rôle in National forest administration.

4. Critical conditions did not develope till about mid summer in the mid-western area which was severe effected.

5. For the summer and Fall of 1933 the nursery inspectors of the various states reported that they made inspections of 305,873, 818 bulbs of all types, and increase of about one per cent over the number reported the previous year. Around 59 per cent of the bulbs reported for 1933 are paper whites and other polyanthus varieties commonly grown in the south, an increase over 1932, and about 41 pervent are of the daffodil type produced in the northern States, a decrease from 1932.

6. Following the gin - trash findings a considerable amount of field - inspection was carried on. The findings involving Lea and Roosevelt counties New Mex. were made while cotton from them was being gined in Texas Counties.

7. From the first 5 bales ginned an average of 136.6 worms per bale were found. Another farm showed an average of 367.5 worms per bale from the first cotton of the 1933 crop.

8. Data regarding evaporation and transpiration along a small canyon and on additional water obtainible if the diversion were made further up the cañon was obtained.

9. The mean winter evaporation-transpiration monthly rate of loss for grass and weed covered land appears to be about 2 and that for brush-covered land 2.4 acre inches per acre.

10. These investigations indicate the mean transpiration rate during the Winter period for all normally-growing agricultural crops is around one and one eighth acre inch per month, and that bare ground, vinyard and clear cultivated deciduous orchards have no serious losses by transpiration during that season.

11. Water supplies are dependant on the amount and distribution of precipitation in the form of rain and snow.

12, In any land utilization-program such as now must be undertaken the basic essentials in the West are for supplies of water available and what they will accomplish.

13. These studies include, with others, determination as to the most economical requirements of irrigated crops, penetration and conservation of precipitation, drainage of water logged areas, losses by evaporation and transpiration, and other related problems.

14. United-States exports increased around 30 per cent in value for August over the coresponding month of 1933, amounting to $ 171, 964,572 compared to $131,462,959.

15. A vortex tube sand-trap with a 50 feet lip-length was constructed by the Colo. Experiment station in the Ft. Lyon canal nearby Las Animas Colorado. Another of what is known as the grating type which has vanes set vertical, normal to the axes of the channel was set-up further up on the stream.

16. William, the conquerer, in September, 1066 A.D. came from Normandy, Fr., and defeating the Saxon King, Harold, on Oct. 14, 1066, became king of Great Briton.

17. The weather being favorable the early potato crop (what there was left of it was shipped to market in carlots. The 1st car load arrived at Chicago Illinois in good condition and was distributed through Cook and lake counties.

18. Ribes have four or five scale like pedals and variously- colored flowers.The fruit is a pulpy few-to-many seeded berry.

19. Currants as we know them, are the fruit of various species of ribes but the word current came from rasons de Corinthe or Corinth, from whence they were imported in Southern France.

20. By means of a fund of $13,000 alloted by the Public works Administration 4 stations were instaled in the Lower Santa-Ana river Basin. These will permit of making accurate determinations of stream-flow and of the amount of river bed-material lost.

21. Aside from the few screw worm flies which mature in living animals, decaying animal-matter is the only media in which breeding occurs.

22. It is possible to so regulate the amont and time of application of water as to produce the most profitable size and quality of fruit.

23. Merger of the projects was in the interests of economy and unified-field supervision. All the spare time of inspectors not utilized in actual inspection and certification was utilized in infestation-surveys in the vicinity of nurseries, and tourist camps in their respective Districts.

24. The herds of big game animals were in good condition with the exception of the mountain sheep whose condition was considered only fair. To avoid depletion of the forage through overgrazing , 89 buffalo, 16elk , and 20 deers,all superfluous stock was removed , 9 Bufalos (bos bison) 1 elk being sold for butchering,and 80 buffalo, 15 elks and 20 deer were donated to the Flathead indian agency and killed on the Range.

25. Indiana,Michigan and Ohio , restrict the movement into their state Boundaries of all quarantined comodities from New England states, N.Y., New Jersey, Pennsyllvania, and Virginia, the latter ten States being designated infested with the two-generation form.

26. Of the nine cows,now five yrs. old seven gave birth to calfs. There are in addition 4 cows now 4 years-old that did not breed.

27. W atering and ventilation are very important, first, to keep the seed properly moistened so that it does not become to dry and second, to avoid overwatering , and the development of the"damping off" disease

28. Recently, a test was made of indirect electric heating where fans were used to drive the air over the heating elements. The action of the fans driving the heat to different parts of the house, tends to provide better ventilation than where no fans are used.

TITLES, TABLES OF CONTENTS, AND HEADINGS

1. Edit the following titles of publications as required by clarity, brevity, grammatical construction, or approved usage, or, if the information necessary for editing is lacking, state the faults of the titles as given. Make all changes or statements on the copy. Extensive revisions should be written in the spaces beneath the original titles.

2. Rewrite the tables of contents given below. Prepare them in proper form and in what would seem to be more logical order, showing indentions as necessary.

3. Examine the headings and subheadings in the publication handed you. If you think they are faulty in any respect rewrite them in the order and form you consider preferable. If you think no editing is required state your reasons specifically. Do not write on the publication but on a separate sheet. Clip the sheet to the publication and hand both in with the other material of this exercise.

TITLES

A Preliminary Report Covering experiments on the Use of Sodium Chlorate and Other Materials as a Herbicide in the Eradication of Field Bindweed.

Relation of the method of Watering to water Consumption and Milk Production of Dairy Cows.

Experiments in bettering Turpentining methods for slash and Long-leaf Pine.

How to find and apply Economic Facts as a Basis for extension programs in Home Economics, Dairying, and Forestry.

Studying the Effect of Environment on the Development of Disease and Selecting for Disease Resistance Presents Problems in Cooperation in Research.

Growth.

The acid Relations of Soils in Relation to crop production.

Plowing in its Effects upon the Fertility of the soil.

Control measures such as Spraying, Fumigation, and Clean cultivation.

Local lesions in tobacco mosaic.

A peculiar freezing trouble of pears in cold storage.

Beef producing qualities of purebred Aberdeen-Angus cattle compared with Arkansas native cattle.

Grain mixtures supplementary to Wyoming native hay for milk production.

Highways in the United States of America and its possessions.

The communities of Schuyler County, New York, 1927.

The effect of different per cents of protein in the diet, I-IV.

Hog feeding experiments.

The Supplemental Value of Beef Protein for that in Certain Cereal and Other Vegetable Products

Studies on Viruses: Preliminary Investigations on Quantitative and Purification Methods

The Relative Efficiency of Calcium Lactate, Chloride, Sulphate, Phosphate, and Carbonate in Egg Production by Hens

Tensile Strength and Elasticity of Wool - II. The Effect of the Method of Feeding and Management

Physiological and Biochemical Studies on Cereals. VI. The Nitrogen

Compounds of the Rice Kernels as Compared with Those of Other Cereals

On the Life History, Habits, and Economic Importance of Some Monochs.

The Relation of Maturity to the Nutritive Value of First, Second, and Third Cutting Alfalfa.

Calcium and Phosphorus Metabolism in Dairy Cows. II. The Relative Assimilation of Clover and Alfalfa Hays and of Rations of Varying Calcium and Phosphorus Content.

TABLES OF CONTENTS

Keeping Farm Accounts

Principles underlying the planting, care, management, and utilization of farm woodlands

Using farm timber
Growth of trees and forests
Protecting woodlands
Forest Planting.
How forests reproduce themselves
Marketing timber grown on the farm.
General information regarding farm woodlands.
Why farmers should have farm woodlands
Different types of farm forests
Agencies that damage farm forests
Where to locate the farm woodland
How to improve the woodland by thinning
Measuring and estimating the timber grown.
The products that may be made
Forest fires and animals

F.J.H.
2.9.34

TABLE CONSTRUCTION

I. Recording of the data in table form is the next logical step after the sorting and counting are completed.

II. Definition of "table".
   a. A table is a triumph of ingenuity and technique, a masterpiece of economy of space combined with a maximum of clearly presented information. (Jerome, page 28)

III. Types of tables.
   a. General-purpose (primary) table.
      1. The general-purpose table is designed to bring together in the most convenient and accessible form all the data bearing upon a given topic. (Day, pages 404-405).
      2. The general-purpose table is designed mainly as a source of fundamental data, giving summations of individual items taken from original schedules and classified under a variety of categories. (Chaddock, page 404).
      3. The general-purpose table is a repository of facts compiled on some general topic for a particular time or period of time. (Sutcliffe, "Elementary Statistical Method, page 37).
   b. Special-purpose (secondary) table.
      1. A special-purpose table is intended to throw into relief relationships of special significance in a given study. It is a record of the results of a statistical analysis. (Day, page 405).
      2. Special-purpose tables are usually compiled from the data contained in the general purpose table and are arranged to emphasize the analysis of the results of a special study. (Sutcliffe, pages 38-39).
   c. Complete cross-classification table.
      1. It is one which indicates for each subclass of any one of the two or more classifications, the apportionment of the given subclass on the basis of any one of the other classifications appearing in the table. (Jerome, page 32).
   d. Partial cross-classification table.
   e. Partially subclassified table.

IV. Structural elements of a Table.
   a. Number.
   b. Title.
   c. Lettering.
   d. Ruling.
   e. Stub.
   f. Caption.
   g. Contents.
   h. Source and footnotes.

V. Principles of table construction. (Day, pages 403-404). (Also, see Mills, pages 73-74).

1. Every table should be self-sufficing, containing within itself a clear explanation of the meaning of the items displayed.
2. Every table should be logically a unit containing only data which are intimately related to one another.
3. Column-and row-headings should be brief, unambiguous, and self-explanatory, table footnotes being used when necessary to make the headings perfectly clear.
4. Coordinate and subordinate relationships among the column- and row-headings should be shown by variations of boxing in the captions and of indentation in the stub.
5. Varieties of letters, figures, lines, column-widths, and inter-linear spacings should be employed to facilitate easy and intelligent use of the table.
6. Columns and rows should be lettered or numbered if cross-reference is desirable.
7. Sources and units should invariably be indicated.

Statistical Tables

A statistical table is an arrangement of data in rows and columns according to some definite classification. Classification is the combination of similar or like data into groups. The purpose of a table is to arrange data in a condensed form to facilitate comparisons. A table consists of (1) number, (2) title, (3) source, (4) legend, (5) rulings, (6) stubs, (7) captions, and (8) contents.

(1) The purpose of the number is to make reference to the table simple and clear. In a large table columns and rows should be numbered or lettered also.

(2) The title should be clear, concise and catchy. It should tell exactly what is in the table, when the data were gathered, or events occurred, where data were collected from, and if possible, the classifications made. If title is too long use a main title and a sub-title with different sized lettering to emphasize important parts.

(3) The source of the data should be given. If you are the original collector of the data, it should be noted in the article in which the table appears rather than in a footnote. Otherwise, a footnote giving the source should accompany each table.

(4) The legend should tell in what units the data in the table are expressed. If all of the data in the table are expressed in the same unit, the legend may be placed above the top ruling or directly under the title. If different units are used for different stubs or captions, the legend should appear at the head of the column or at the left of the row.

(5) Each columnar line and each space between rows in the table should have a definite purpose. There are several styles of ruling tables, but one should decide upon the style best suited for this purpose and follow it rigidly.

(6) and (7) Stubs and captions should be arranged in some definite order, i.e. chronological, alphabetical, geographical, or according to some natural division of the subject matter. The stubs and captions should adhere to the definitions or limitations expressed by the stubs, and captions, respectively, and if repeated should always be arranged in the same order each time. They should be brief, but long enough to be self-explanatory. They must be rigidly defined.

(8) Only data that are closely related should be shown in the same table. All possible repetition of figures in a table should be avoided. Every table should be as simple as possible. Simplification leads to a better understanding of the contents and brings out more clearly the comparisons that are intended. The data should be arranged so that comparisons to be most frequently made can be most easily made.

S A M P L E

Table 1.--Classification of second hand fords at A. Bee Ford Agency, January 1, 1930, showing the type, model, year of car and kind of wheels

Type of car and year of make	Model of car and kind of wheels								
	Total cars			Wire wheels			Wooden wheels		
	Total	Model A	Model T	Total	Model A	Model T	Total	Model A	Model T
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Total	163	88	75	104	78	26	59	10	49
Roadster	25	16	9	16	15	1	9	1	8
Touring	13	5	8	9	5	4	4	0	4
Coupe	48	27	21	32	25	7	16	2	14
Tudor	44	22	22	28	21	7	16	1	15
Fordor	33	18	15	19	12	7	14	6	8
1928 model total	118	65	53	79	57	22	39	8	31
Roadster	18	13	5	13	12	1	5	1	4
Touring	9	4	5	7	4	3	2	0	2
Coupe	35	20	15	24	18	6	11	2	9
Tudor	34	18	16	22	17	5	12	1	11
Fordor	22	10	12	13	6	7	9	4	5
1929 model total	45	23	22	25	21	4	20	2	18
Roadster	7	3	4	3	3	0	4	0	4
Touring	4	2	2	2	1	1	2	0	2
Coupe	13	8	5	8	7	1	5	0	5
Tudor	10	6	4	6	4	2	4	0	4
Fordor	11	6	5	6	6	0	5	2	3

John Doe Statistical Agency, New Cork, New Jersey. Compiled from records of the Automobile Market Corporation, Old City, New York.

Note: Order of importance: (1) type of car, (2) model of car, (3) year of make, and (4) kind of wheels. Attention is called to the placement of totals.

GRAPHIC PRESENTATION

I. Purpose of Graphics.
   a. For the simplification, visualization, interpolation, and interpretation of quantitative data.

II. Standards of Diagrammatic Presentation. (Secrist, pages 212-213; Jerome, pages 51-52; Sutcliffe, page 52; Mills, pages 51-59).
   a. The statistical facts and graphic device must agree.
   b. The graphic device must be of an appropriate form selected according to psychological appeal and ease of comprehension.
   c. The illustrations used should be those least misunderstood, and most faithfully and correctly interpreting the facts.
   d. Charts should be verifiable by reader. Indicate on the diagrams the scales of values used. Include as a part of the chart the data which the chart illustrates.
   e. Graphic devices are to be considered as illustrations of analyses rather than methods by which analyses are made.

III. Graphic Forms: Time Element Constant. (First numbers refer to chart numbers in Jerome; the second, to Mills, Blank indications no illustration).
   a. One variable.
      1. Horizontal bar chart.
         A. Simple horizontal bar chart. (1; -)
         B. Sub-divided horizontal bar chart. (3; -)
         C. Percentage horizontal bar chart. (4; -)
      2. Statistical maps.
         A. Cross-hatch map. (8; -)
         B. Multiple dot map. (9; -)
         C. Quartered dot map. (10; -)
         D. Graduated dot map. (-; -)
      3. Area and volume charts.
         A. Pie diagram.
            I. Open-face type. (11; -)
            II. Cross-hatch type. (12; -)
         B. Emblematic pictograms.
      4. Frequency charts.
         A. Discrete series.
            I. Vertical bar chart. (7; -)
         B. Continuous series.
            I. Histogram. (20 and 21; 22, 23, 24, 25, 29, 30, and 31)
            II. Polygon. (20 and 21; 26, 27, 28, 40, 41, and 42)
            III. Smoothed curve. (20 and 21; 32, 36, and 43).
            IV. Cumulative (ogive) curve. (24; 33, 34, and 35).

b. Two variables.
   1. Scatter diagram.(39; 67, 72, 80)
   2. Double frequency diagram. (-; 68, 69)

IV. Graphic Forms: Time Element Varying
   a. One variable.
      1. Arithmetic scales.
         A. Horizontal bar chart. (2;-)
         B. Vertical bar chart. (5;-)
         C. Time (line) graph or historigram. (13; 13, 15, 64, 74, 75)
            I. Simple.
            II. Cumulative.
         D. Special graphs.
            I. Component-parts band chart. (14;18)
            II. Silhouette excess-and-deficit chart. (15;-)
            III. Year-month chart. (16;-)
            IV. Gantt progress chart. (-;21)
      2. Log-arithmetic scales.
         A. Ratio chart (22 and 23; 12, 14, and 16)
      3. Log-log scales. (-;83)
   b. Two variables.
      1. Scatter diagram. (-;81, 82, and 84)
      2. Double frequency scatter diagram.

V. Working rules for chart making. (See Jerome, pages 52-58; 75-78, pages 104-106; Mills, pages 51-59).

SUMMARY DEVICES

I. Methods of Describing a Frequency Distribution.
  a. Graphic devices.
    1. Array.
    2. Frequency distribution.
      A. Histogram.
      B. Polygon.
      C. Smoothed curve.
  b. Disadvantages of graphic devices.
    1. Difficulty of analysis and comparison because of different scale units.
    2. Description of graphic devices or comparison of graphic devices is possible only in descriptive or comparative words or approximations which are inaccurate.
    3. Because the human mind cannot ably grasp and retain in proper relation curve comparisons, an analytical comparison of two or more graphic devices simultaneously is grossly difficult and usually inaccurate.
  c. Types of analytical summary devices necessary.
    1. A measure of central tendency, i. e., an average.
    2. A measure of the degree of dispersion and concentration about the central tendency, i. e., a measure of variation or dispersion.
    3. A measure of the lack of symmetry; i. e., skewness.
    4. A measure of the degree of peakedness of the frequency distribution, i. e., kurtosis.

F. J. H.
2/9/34

FREQUENCY DISTRIBUTION

I. Classification of Quantitative Data.

(a) Purpose.

(1) To bring order out of confusion of many individual values.
(2) To permit a preliminary analysis of the data.

(b) Methods.

(1) Array: rank of values in order of size.

A. Advantages.

1. Permits calculation of range.
2. Ability to note point of central tendency.
3. The characteristics of data begin to appear.

(2) Frequency distribution.

A. Magnitude classes or class intervals.

1. Advantages.

a. It is of a simpler form than an array.
b. More accurate indication of regularities of distribution.
c. Comparison with other distributions is possible from standpoints of central tendencies, ranges, dispersion, kurtosis, etc.

B. Assumptions underlying the formation of frequency classes.

1. Even or uniform distribution of items in each class interval, or
2. Concentration of all items at the mid-value of the class, or
3. Distribution of items in each class interval in form of normal curve.

C. Size of class interval (or number of classes).

1. Size of class interval should be adjusted without material sacrifice of accuracy.

a. Arrange classes so there will be an even distribution throughout each class, or the average of all values in each class will equal the mid-value.
b. The number of classes should be so determined that an orderly and regular sequence of frequencies is secured.
c. Number of classes should be limited to 15 to 20 in order that data can be manipulated easily and their significance grasped and appreciated.
d. In data that cluster about a point, make the point if possible a mid-point of an interval.
e. Class intervals should be equal in width.
f. Size of class intervals in a continuous series should be taken to the point at which the histogram represents clearly the distribution of an infinite number of samples.

II. Graphic Presentation.
   (a) An array.
   (b) Frequency distribution.
      (1) Histogram.
      (2) Polygon.
      (3) Smoothed Curve.

III. Histogram.

IV. Polygon.

V. Smoothed Curve.
   (a) Purpose.
      (1) Estimate the distribution of frequencies within a given class.
      (2) To smooth out accidental irregularities shown by the sample and thus more nearly to approximate the graph which would best represent the universe (population) from which the sample was taken.
   (b) Method.
      (1) Connect mid-point of each class interval by a line (polygon).
      (2) The curve should be so smoothed that the total area under the resulting curve is equal to the sum of the area of the original rectangles.
      (3) Where possible, the areas of the individual rectangles are to remain approximately unchanged.
      (4) The curve must be free from abrupt changes in direction.
      (5) Ordinarily the peak of smoothed curve should equal or slightly over-top the peak of the frequency polygon.
      (6) In general, the nearer the approach to a truly continuous series, the more appropriate does the smoothing process become.

First Test Paper on Table Formation and Arrangement

The following examples are submitted to test the student's knowledge and judgment of correct form in the preparation of tables. In each example are common mistakes which the student is expected to correct. Corrections should be made on the copy where possible, but if any table requires transposing new copy should be prepared. From the textual material the student will prepare a suitable table. The figures in all cases may be considered correct, so no time need be spent on verification.

Table 1 - Yields[1/] of edible Sudan-grass hay per acre when cut at varying stages of maturity, 1928-29

Item of comparison	1928			1929			
	First heads out	Full head	Soft dough	First heads out	Full head	Soft dough	30 days
Yield per acre............pounds	3723	3911	3554	5172	4842	5131	3043
Amount refused by cows - per cent	19.7	34.0	30.2	15.8	30.4	18.3	16.5
Yield of edible hay per acre....................pounds	2990	2581	2481	4355	3853	4192	2541

1/ Air-dry basis

Table 2. -- Cost of preparing an acre of land for corn, 1860-1930.

Year	Spreading fertilizer	Plowing	Disking	Harrowing	Planting	Cutting and shocking	Husking
1860	2.40	2.75	--	1.25	.75	1.30	2.00
1880	2.80	3.00	--	1.25	.85	1.40	2.00
1900	3.00	3.20	.75	.60	1.00	1.75	2.50
1910	3.00	3.20	.80	.65	.50	2.00	3.00
1930	3.50	2.50	.90	.40	.75	2.50	3.25
Total	14.70	14.45	2.45	4.15	3.85	8.95	12.75

Table 3.--Comparison of estimated long-distance motor-truck with rail and boat unloads of leading fruits and vegetables at five cities

Long distance truck unloads	Car-lot rail and boat unloads from-- States originating truck unloads	Car-lot rail and boat unloads from-- All sources	Relation of truck unloads to total unloads from-- States originating truck unloads	Relation of truck unloads to total unloads from-- All sources	State of origin of truck unloads	City
Cars	Cars	Cars	Percent	Percent		
3,343	382	5,545	90	38	New York....................	Buffalo....
266	255	7,035	51	4	Illinois, Indiana, Tenn., Mich.	Indianapolis
2,264	162	2,293	93	50	New York....................	Rochester...
1,715	76	1,659	96	51	...do........................	Syracuse....
847	1,204	15,599	41	5	Illinois, Missouri, Mich., Tenn.	St. Louis...
Total 8,435	2,079	32,131	80	21	....	....

Table 4.--Readily available phosphorus 1/ in soils of Grant County, Okla

Total number of samples	Very high	High	Medium	Low	Very low
78	40	26	4	8	0

1/ Soluble in a 1-to-10 extract of fifth-normal sulphuric acid

Construct Table 5 from the following:

Seeds of Ribes americanum and Ribes cynosbati were collected on August 31 and September 3, 1924, and divided into lots of 100 seeds which were sown on September 15, 1924, and March 5, 1925. 202 days later the seeds of R. americanum in lot A showed a germination of 74 per cent, and 264 days after sowing the germination was 74 per cent, which was the percentage of total germination. The seeds of lot B showed a germination of 5 per cent at 182 days, 13 per cent at 221 days, 29 per cent at 332 days, and 35 per cent at 576 days. The total germination was 35 per cent. Seeds of R. cynosbati of lot A sown September 15 showed 79 per cent at 228 days, 84 per cent at 290 days, and no more germinated; of lot B, 144 days after sowing 7 per cent had germinated, 247 days after sowing 25 per cent had germinated, and the final count at 633 days showed 26 per cent. Lots C sown March 4, 1925, showed 2 per cent germination of R. cynosbati at 42 days, 2 per cent of R. americanum at 93 days and 16 per cent at 432 days, 7 per cent of cynosbati at 462 days, and a total germination of only 7 per cent of each lot and species. Only 1 per cent of the seed of lot D of Ribes americanum sown March 4, 1925, germinated in 93 days and 7 per cent in 432 days; 13 per cent of cynosbati germinated in 42 days and 19 per cent in 462 days.

Second Test Paper on Table Formation and Arrangement

The following examples are submitted to test the student's knowledge and judgment of correct form in the preparation of tables. In each example are common mistakes which the student is expected to correct. Corrections should be made on the copy where possible, but if any table requires transposing new copy should be prepared. The figures in all cases may be considered correct, so no time need be spent on verification.

Table 1. Correction for effect of site quality and structure upon cubic-foot yield of selectively cut stands of ponderosa pine 60 years after cutting

Percentage of basal area in tree class 5	Percentage of basal area in tree classes 1 and 2										
	0	10	20	30	40	50	60	70	80	90	100
				Correction percentage 1/ for site quality IV							
0	65	73	82	90	98	106	115	123	131	140	148
10	70	78	87	95	103	111	120	128	136	145	
20	75	83	92	100	108	116	125	135	141		
30	80	88	97	105	113	121	130	138			
40	85	93	102	110	118	126	135				
50	90	98	107	115	123	131					
60	95	103	112	120	128						
70	100	108	117	125							
80	105	113	122								
90	110	118									
100	115										

1/ For site quality III, add 12 to the above percentages. For site quality V, subtract 12 from the above percentages.

Table 2.--Time required for 100 percent germination of tubers in the sprouting room after various preliminary periods in storage at different temperatures

When planted	Storage temperature	Degree of maturity when dug	Average time (in weeks) required for 100 percent germination in the sprouting room (70°F.) of tubers tested after various periods in storage (weeks) at different temperatures										
			2	3	4	5	6	7	8	9	10	11	12
	°F.												
Early 1926	40	Mature............	9	-	7	-	5	-	-	5	-	5	-
Late 1926	40	Mature............	-	-	-	-	6	5	5	5	4	3	3
Late 1926	40	Immature..........	-	-	-	-	6	7	5	5	5	5	4
Late 1927	40	Mature............	9	-	7	-	-	-	-	4	4	4	-

Table 3. -- Annual cost per acre of operating a nut orchard and yield required to cover costs

Item		Quantity per acre	Cost per acre
			Dollars
Labor and power prior to harvest			
Man labor	hours	26.0	6.82
Horse work	do	8.5	1.28
Tractor work	do	2.3	2.87
	Total	--	10.97
Materials			
Fertilizer at $37.50 per ton	pounds	570	10.69
Winter cover crop, vetch at 12¢ per lb.	"	20	.84
Miscel.		--	60
	Total	--	12.13
Other costs			
Taxes		--	.14
Use of machinery		--	90
Overhead		--	3.46
	Total	--	4.50
Total cost exclusive of interest		--	27.60
Interest at 6%		--	8.14
Total cost including interest		--	35.74
Quantity of nuts at 30¢ a lb. required to cover cost including harvest			
Exclusive of interest	pounds	103	--
Inclusive of interest	"	132	--

Table 4.--Method of sale of fruits and vegetables from farms supplying New York markets as related to distance from New York.

Percent of sales	Distance from New York						
	1-5	6-10	11-20	21-40	41-60	61-100	Over 100
Through commission men	0	20.4	34.6	26.9	46.5	61.1	82.6
At Farmers' Markets	60.5	53	39.5	52.1	19.4	6.5	0.5
At farms	5.5	6.9	11.7	14.3	19.8	14.8	7.3
By other methods	34.	19.7	14.2	6.7	14.3	17.6	9.6

Table 5.--Cost in operation of equipment used for farm storage of bulk grain

Item	Farm-storage plants				Gas engines	Farm elevating devices[5]
	Stationary		Portable			
	Wood	Metal	Wood	Metal		
Records..........number.	33	20	8	7	45	43
Distance to shipping point..miles.	5	6	7	11	-----	-----
Capacity..........bushels.	8,398	6,243	2,844	5,607	(4)	-----
Cost when purchased.......dollars	1,374,08	740.00	258.00	646.40	128.97	159.78
Investment per bushel.......do...	.16	.12	.09	.12	------	------
Age in 1929..........years.	13	8	5	9	6	7
Estimated total life.......do...	35	32	12	30	15	18
Cost, 1929, for--						
Depreciation[1/].........dollars	41.69	24.73	16.60	21.81	9.54	11.51
Repairs..........do...	2.09	1.61	1.25	-----	1.06	4.30
Insurance..........do...	3.55	0.65	----	-----	-----	0.10
Gas, oil, and grease.....do...	-----	-----	----	-----	14.13	-----
Interest[2/]..........do...	52.72	33.02	7.86	27.61	4.78	6.07
Total..........do...	100.05	60.01	25.71	49.42	29.51	21.98
Amount chargeable to bulk-stored grain[3/]..........do...	97.92	59.82	25.71	49.42	22.59	21.98
Cost per bushel stored in 1929..........cents.	1.17	.96	.90	.88	.18	.18

1/ Straight-line depreciation was figured; a machine having an estimated life of 10 years would have a depreciation charge of one-tenth its original cost during each year of its life.

2/ 6 per cent interest was charged on the average value of the equipment in 1929.

3/ Only a portion of the year's expense on stationary storage plants and gas engines is chargeable to bulk-stored grain since these items were used for other purposes during the year.

4/ 12 per cent of these engines were under 3 horsepower in size; 71 per cent were 3-6 horsepower (6 horsepower being most common), and 17 per cent were over 6 horsepower in size.

5/ 70 per cent of the elevating devices were of the drag type, 18 per cent cup type, and 12 per cent blower type.

ILLUSTRATIONS AND LEGENDS

1. Hand in one or more bulletins, circulars, or similar publications, which contain an illustration and also a legend which you consider faulty, and give your reasons in detail on a sheet attached to the printed matter.

2. From the following data construct graphs that will show the desired relationships clearly and most appropriately.

A. One of the tomato diseases develops spots on the fruits. The spots enlarge more rapidly on ripe than on green fruit, as shown by experiments the results of which are here given. At the beginning of the experiment the tomatoes were separated into three lots -- ripe tomatoes, nearly ripe tomatoes, and green tomatoes. The tomatoes in each lot were separated further into lots on the basis of size of spots on the fruits. The diameters chosen for the classification were 0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, and 5.0 millimeters. At the end of the experiment it was found that the spots had increased in diameter as shown below:

Diameter of spots at beginning of experiment	Increase in diameter of spots on ripe fruits	Increase in diameter of spots on nearly ripe fruits	Increase in diameter of spots on green fruits
Mm.	Mm.	Mm.	Mm.
0.0	0.29	0.18	0.12
0.5	.27	.17	.11
1.0	.24	.15	.09
1.5	.22	.12	.08
2.0	.21	.11	.07
2.5	.19	.10	.06
3.0	.17	.09	.05
3.5	.16	.08	.04
4.0	.14	.06	.03
4.5	.13	.05	.02
5.0	.12	.04	.01

B. An experiment was conducted to determine the temperature of the bark on the north side of some western yellow pine trees as contrasted with the temperature of the bark on the south side of the same trees. The following data were obtained.

Time at which temperature was taken	Temperature on North side °F.	South side °F.
10 A.M.	43	50
11 A.M.	45	58
12 M.	57	66
1 P.M.	58	72
2 P.M.	59	75
3 P.M.	56	60
4 P.M.	48	52

3. The octavo-size publications of the Department allow for a maximum size of 4 1/8 x $7\frac{1}{2}$ inches for illustrations, including space for legends. Assume that one-half inch will be required for the legends in the following examples, whether the illustrations are placed narrow or broad. Mark each of the illustrations here given for reduction or enlargement so that one side will be maximum width or length and at least one half inch be left on the other side for the legend.

Problem: What will be the other dimension in each case ?

Illustration 1	-	5 x 7 inches
Illustration 2	-	8 x 16-3/4 inches
Illustration 3	-	$2\frac{1}{2}$ x 6 inches
Illustration 4	-	$3\frac{3}{4}$ x $5\frac{1}{2}$ inches

4. Edit the following legends according to the Department style.

Fig. 1: -- Plows used on the experimental Farm -- a: disk plow.

b. Sulky Plow; C, moldboard Plow.

Figure 2 -- : Roots of plants after they were exposed to the air:

Natural Size; A: Corn roots as they appeared 24 hours after exposure:

No root hairs developed on them. b.--wheat roots 2 days after exposure.

X 5.

Fig. 3. -- a: cross section of maple stem. B. -- longitudinal section of Maple Stem; c; Radial section of oak Stem.

Figure 4, A. -- The experimental plots as they appeared when the work was begun. Seventy plots were used. b: the wheat of five varieties grown on the plots. The photograph was taken just before harvest. Photographed by the Jones Photo Co.

1.9
Ag8Ed

The following tables, textual material, and graph are to be edited for statistical accuracy only. No attention need be paid to the English or to the boxheadings, etc.

No checking is to be done on Table 4. It is presented merely as a means of checking Figure 1.

Table 1.--Average initial and final weights and daily gains of calves for three suckling periods

Lot No.	Period	Calves	Average age at beginning of period	Average weight Initial	Average weight Final	Average daily gain	Average appraised final value
		Number	Days	Pounds	Pounds	Pounds	Dollars
1	(May 30-Nov. 21, 1925	8	56	192	484	1.67	8.75
	(June 30-Nov.17, 1926	7	76	233	492	1.58	8.50
	(June 23-Dec. 8, 1927	8	86	239	493	1.51	10.50
	Average		73	221	490	1.66	9.29
2	(May 30-Nov. 21, 1925	12	54	193	590	2.26	10.75
	(June 30-Nov.17,1926	9	79	232	573	2.43	10.25
	(June 23-Dec. 8, 1927	8	81	241	622	2.27	13.25
	Average		71	222	593	2.31	11.42
3	(May 30-Nov. 21, 1925	12	55	188	454	2.04	9.75
	(June 30-Nov.17, 1926	9	82	240	590	2.49	10.00
	(June 23-Dec. 8, 1927	9	81	233	646	2.46	13.00
	Average		71	217	558	2.29	10.84
4	(May 30-Nov. 21, 1925	9	53	187	509	1.84	9.25
	(June 30-Nov.17, 1926	7	81	226	514	2.05	9.00
	(June 23-Dec. 8, 1927	7	77	233	546	1.87	11.00
	Average		68	212	522	1.91	9.73

The average appraised value of the calves in lot 2 was more than 2 percent greater than that of the calves in lot 1.

Table 2.--Car-lot shipments of cattle by months, 1922-1925

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars	Cars
1922	21	12	13	18	72	154	230	352	717	800	143	43	2,575
1923	16	22	13	21	11	15	50	249	540	933	368	77	2,315
1924	26	7	9	15	8	12	49	226	513	966	527	114	2,427
1925	20	12	16	24	10	15	227	780	757	596	87	33	2,577
Average	21	13	13	20	25	94	139	402	632	824	281	67	2,485
Percentage of total	0.8	0.5	0.5	0.8	10.0	2.0	5.6	16.2	25.4	32.2	11.3	2.7	100

The average shipments of cattle ranged from 21 to 824 car-lots per month. In October they averaged 30 percent more than in September, but in November the shipments were 193 percent less than in October.

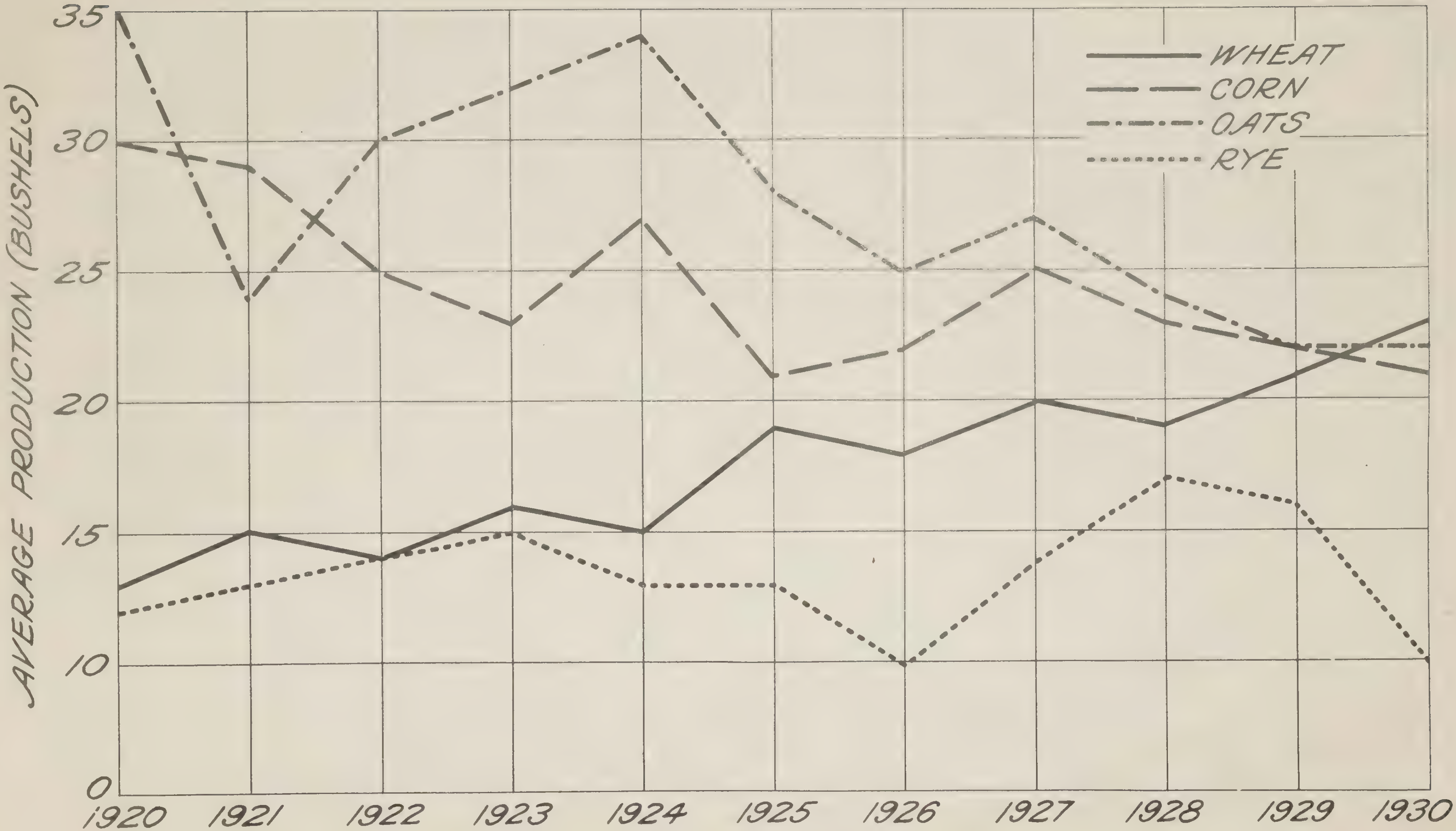
An examination of 10 lots of puparia obtained from infested blueberries in the season of 1927 indicated (Table 3) an average of 29.17 percent parasitized. The lowest parasitism recorded from examination of these puparia was 3.82 percent, and the highest was 49.42 percent.

Table 3.--Parasitism of the blueberry maggot by Opius melleus, based on puparia examined, 1927

Lot No.	Non-parasitized puparia	Parasitized puparia	Percentage parasitized	Lot No.	Non-parasitized puparia	Parasitized puparia	Percentage parasitized
1------	207	133	39.12	8------	92	23	20.00
2------	139	85	37.95	9------	103	93	47.45
3------	94	24	20.34	10-----	130	127	49.42
4------	58	19	24.86				
5------	149	39	20.75				
6------	139	56	28.72				
7------	59	2	3.28	Total or average	1,170	610	29.17

Table 4.--Average yield per acre of wheat, corn, oats and rye, 1920-1927

Year	Wheat	Corn	Oats	Rye
1920	13	30	35	12
1921	15	29	24	13
1922	14	25	30	14
1923	16	28	32	15
1924	15	27	36	13
1925	19	21	28	13
1926	18	22	25	15
1927	20	25	27	14
1928	21	23	24	17
1929	21	22	22	16
1930	23	21	22	10


WHEAT
CORN
OATS
RYE
AVERAGE PRODUCTION (BUSHELS)
35
30
25
20
15
10
0
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930

CROSS REFERENCES--See and See also

1. See refers from a possible heading under which the references are given to the chosen heading where they may be found:

Swine. See Hogs.

See references may be divided as follows:

a. From a subject heading under which reader might reasonably expect to find material to the heading chosen:
   Roaches. See Cockroaches.
   Zebu cattle. See Cattle, Brahman.
   Latex. See Rubber.
b. From a scientific to a popular name:
   Avena sativa. See Oats.
   Medicago sativa. See Alfalfa.
   Soja max. See Soybean.
c. From a popular to a scientific name:
   Oats. See Avena sativa.
   Alfalfa. See Medicago sativa.
   Soybean. See Soja max.
d. From a word not spelled in accordance with the Style Manual or department usage, to the approved form:

   Gipsy moth. See Gypsy moth.
   Live stock. See Livestock.
   Potatoes, sweet. See Sweetpotatoes.
   Syrup. See Sirup.

2. See also connects headings which represent allied subjects:
   Reforestation. See also Forestation; Forestry.
   Slaughtering. See also Butchering.
   Refrigeration. See also Cold Storage.

See also references connect:

a. General with specific headings:
   Rootworm. See under specific host.
   Rodents. See also Gophers; Mice; Prairie dogs; Squirrels.
   Beverages. See also Coffee; Milk; Tea.
   See also under specific name

b. Headings which are related or contain allied matter:
   Sewing. See also Dressmaking.
   Laws. See also Legislation.
   Hunting. See also Game.
   Slaughtering. See also Butchering.
   Scales. See also Weights.

3. The words "see" and "see also" must be in italic in indexes only. Set "see" and "see also" in roman when they precede italic words. (Style Manual, p. 96.)

FILING

1. Arrange cards in alphabetical order--by first words, letter by letter; then by second words, letter by letter, etc.

    Black rot, apple
    Black stem rust, barley
    Blackberry diseases
    Blackbird, study

2. Dates precede words.

    Rust control
    Rust control, 1911
    Rust control, 1912
    Rust control, and eradication
    Rust control by spraying

3. Figures are filed as if spelled out.

    Pine, cork
    Pine, 5-needled
    Pine, jack
    Pine, white

    Clubs, boys and girls
    Clubs - 4-H
    Clubs, poultry

4. File prefixes S. and St. as if written out.

    Sable, protection laws
    St. Louis, milk laws
    Sales, cattle, at Chicago.

5. File cross references at the end of the subject if general, or, if specific, at end of modification to which they refer.

    Poultry, marketing. See Marketing, poultry.
    Poultry. See also Chickens.

6. In a large index it is often expedient to combine singular and plural entries.

    Apple (s)
    Blackberry (ies)
    Fly (ies)
    Potato (es)

7. When the same word serves for several kinds of heading, the order should be: Person, place (cities before States), subject.

    Cotton, John
    Cotton (City), Alabama
    Cotton, acreage

    Washington, Booker T.
    Washington (D.C.) or (City)
    Washington (State)

1.9
Ed

Editing Technical Material

Edit (on the copy) the material given below. Put it in suitable form for publication in the Journal of Agricultural Research. Remember that this article is written for specialists in the field treated. Arrange the material in logical order, and insert appropriate headings and subheadings. Delete any material that may be irrelevant. Correct any statements or conclusions that are shown by the context to be erroneous. Assume the statistical correctness of matter in tables and figures. The list of literature cited has purposely been omitted.

STUDIES AND FEEDING EXPERIMENTS WITH HONEY
USING RATS AS THE EXPERIMENTAL ANIMALS

Honey has been considered a valuable food since times began. Consisting as it does of a mixture of dextrose and glucose it is easily eaten and digested, and this fact may account in part for the good results obtained when it is used in the diet, especially of growing infants. Since honey can be used to advantage in the human diet of infants, children, and adults, the question arose as to whether it might not be a source of some or all of the vitamins. A review of the literature revealed the fact that very little work had been done in the way of determining quantitatively the vitamin content of honeys and honeycombs.

Since it was out of the question to make an exhaustive examination of honeys of all the principal floral sources, and the flowers from all the honey-growing regions of the world, three samples representing the extremes of color variation were chosen for investigation and study. None of the honeys had been heated as is often the case with extracted honey. Honey No. 1 was a white-clover honey from Grover Hill, Ohio. This was in a granular state when received. Honey 2 was a buckwheat honey, very dark in color, produced near Varysburg, N. Y. 3 was a light-colored white-clover honey from Middlebury, Vt.

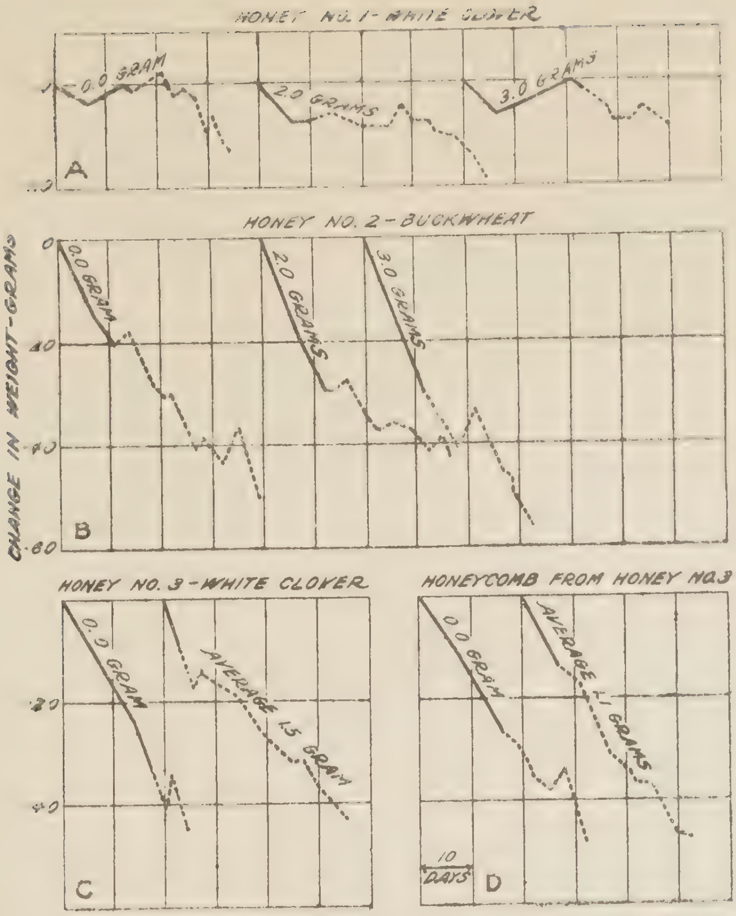


Figure 1. Changes in weight made during the test period by groups of rats fed honey or honeycomb as the sole source of vitamin A. Each curve is the average result of several tests. The amount of honey or honeycomb received by each rat six times per week is indicated on each curve.

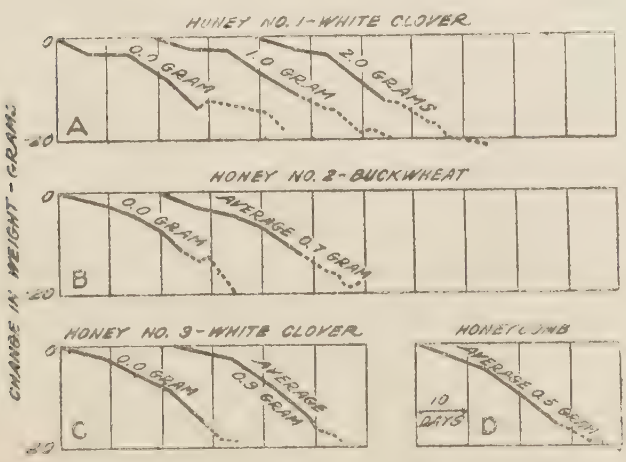


Figure 2. Curves showing changes in weight made during the test period by groups of rats fed honeycomb as the sole source of vitamin B. Each curve is the average result of several tests. The amount of honey or honeycomb fed to each rat six times per week is indicated on each curve. The change in weight for the group is represented by a solid line to the point where the death of the first animal occurred. The broken line represents the averages for the surviving animals until all had died.

It was drained from the comb and the comb was pressed as free from adhering honey as possible and was also used in feeding tests.

The method used for vitamin A determinations was essentially that of Sherman and Munsell with a few modifications.

The basal diet consisted of casein (purified), 18 per cent; starch, 67 per cent; brewery yeast, 10 per cent; Osborne and Mendel salts, 4 per cent; table salt, 10 per cent. The diet was irradiated with the light from a mercury vapor quartz lamp to insure an abundance of vitamin D. The rats were fed the vitamin-A-free diet until stationary or declining weight and appearance of symptoms due to vitamin A deficiency indicated that their body stores of vitamin A were depleted. As soon as the rats were in a suitable condition to be used for tests they were weighed and placed in individual cages. A weighed amount of the vitamin-A-free food was given to each rat and the honey was fed as a daily supplement to this diet.

Honey Nos. 1 and 2 were fed daily in amounts of 1, 2, and 3 gm. per day. The plan of feeding daily portions of honey to the rats required a great deal of time. For this reason honey No. 3 and the honeycomb were incorporated in the basal diet in place of 30 per cent of the starch in the diet. In each litter one or more animals were designated as controls and received only the basal diet during the test period. The test period was continued for eight weeks, or until it was officially terminated by the lamentable death of the rat. If the rat did not live out the eight weeks the last recorded weight is that of the deceased rat. Autopsies were performed on all animals to determine whether the gross pathological lesions shown by animals confined to a vitamin-A-free diet were present. Table 1 gives the weights and survival periods of the rats used for these tests and also records the pathological lesions found. Curves showing the changes in weight made by averaging re-

Table 1.--Weight records of rats fed honey and honeycomb as the sole source of vitamins A and C

WHITE-CLOVER HONEY (NO. 1)

Quantity of honey fed per rat per day, 6 days per week (grams)	Rat No.	Weight of rats at age of 4 weeks	Weight of rats	Successive weeks of test period 1	2	3	4	5	6	7	8	Period of survival
		Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams
	907	54	67	65	68	74	67	52	----	----	----	91
	922	50	65	62	63	71	54	50	----	----	----	84
	923	48	58	52	60	56	59	42	----	----	----	87
	937	51	66	64	68	78	77	54	----	----	----	84
0--------	968	61	80	83	98	86	71	----	----	----	----	74
	975	54	71	68	88	85	77	60	----	----	----	83
	993	59	88	92	85	84	77	66	----	----	----	79
	996	52	77	70	74	70	66	50	----	----	----	79
	1110	36	80	69	56	53	---	----	----	----	----	57
	1123	45	85	78	75	76	58	----	----	----	----	59
Average --	----	----	----	----	----	----	----	----	----	----	----	77.7
	908	53	70	64	63	70	64	54	----	----	----	91
	921	46	55	53	51	57	53	45	----	----	----	91
	935	58	79	71	75	83	77	69	----	----	----	82
	972	56	61	53	49	----	----	----	----	----	----	59
2.0------	974	54	70	67	82	83	79	66	55	51	----	93
	994	57	83	77	77	60	61	57	----	----	----	79
	1107	64	116	95	95	75	----	----	----	----	----	63
	1120	45	92	84	80	79	60	----	----	----	----	61
Average --	----	----	----	----	----	----	----	----	----	----	----	77.4
	924	44	52	45	50	49	45	----	----	----	----	77
	925	42	50	45	48	52	44	36	----	----	----	84
	933	62	76	64	67	86	92	82	67	----	----	89
3.0------	934	52	66	58	60	67	62	49	----	----	----	84
	971	57	67	62	81	84	70	59	----	----	----	81
	995	55	86	84	77	76	60	58	----	----	----	78
	1119	46	95	88	83	78	77	71	----	----	----	67
Average --	----	----	----	----	----	----	----	----	----	----	----	80.0

BUCKWHEAT HONEY (NO. 2)

	1366	55	134	123	109	84	----	----	----	----	----	55
	1373	48	111	91	91	68	68	----	----	----	----	56
	1391	55	130	110	105	104	88	75	----	----	----	70
0----------	1396	52	120	96	98	96	65	----	----	----	----	65
	1404	57	136	125	127	112	109	100	85	----	----	74
	1405	58	124	113	121	105	77	----	----	----	----	63
	1415	59	139	123	100	----	----	----	----	----	----	48
	1420	54	111	109	95	73	----	----	----	----	----	56
Average--	----	----	----	----	----	----	----	----	----	----	----	60.9
	1368	50	126	109	103	81	69	----	----	----	----	59
	1372	53	117	102	90	82	74	74	----	----	----	66
	1390	59	147	120	93	88	----	----	----	----	----	54
2.0--------	1393	55	115	103	95	94	98	76	72	----	----	74
	1403	61	157	125	115	95	94	----	----	----	----	57
	1407	56	118	97	109	100	82	67	----	----	----	67
	1417	52	119	104	80	----	----	----	----	----	----	49
Average --	----	----	----	----	----	----	----	----	----	----	----	60.[illegible]
	1365	56	139	125	92	90	----	----	----	----	----	42
	1371	54	120	97	83	95	72	68	----	----	----	63
	1389	59	137	126	95	81	----	----	----	----	----	49
3.0--------	1392	49	126	94	99	94	80	68	----	----	----	69
	1402	63	153	135	107	89	----	----	----	----	----	54
	1406	57	126	96	103	90	77	----	----	----	----	62
	1414	61	132	121	111	91	----	----	----	----	----	58
	1418	51	123	106	81	----	----	----	----	----	----	48
Average --	----	----	----	----	----	----	----	----	----	----	----	55.6

Table 1.--Continued

LIGHT-COLORED WHITE-CLOVER HONEY (NO. 3)

	2908	58	114	102	93	80	---	---	---	---	---	65
0--------	3086	57	131	108	95	79	---	---	---	---	---	65
	3089	52	114	105	93	80	69	---	---	---	---	69
	3092	49	110	105	92	70	---	---	---	---	---	65
Average -	-----	---	---	---	---	---	---	---	---	---	---	66.0
	2903	63	137	101	---	---	---	---	---	---	---	54
	2904	62	120	113	109	89						67
	2906	57	134	94	---	---	---	---	----	---	---	54
	2907	58	98	87	---	---	---	---	---	---	---	51
Average, 1.5 (30 per cent of diet)	2909	55	118	109	96	94	76	---	---	---	---	76
	2910	54	115	85	95	85	84	72	---	---	---	83
	2911	50	106	82	---	---	---	---	---	---	---	54
	3085	57	125	118	98	94	80	---	---	---	---	70
	3087	50	104	87	84	---	---	---	---	---	---	53
	3088	56	123	105	108	90	92	---	---	---	---	72
	3090	51	105	95	90	78	76	64	---	---	---	76
	3091	50	117	100	87	80	---	---	---	---	---	66
	3093	40	100	94	91	83	63	---	---	---	---	72
Average---	----	---	---	---	---	---	---	---	---	---	---	65.[illegible]

HONEYCOMB

	3128	58	114	107	107	83	72	---	---	---	---	65
	3129	57	117	110	83	74	---	---	---	---	---	62
	3131	54	112	100	94	86	88	69	---	---	---	74
	3141	70	153	144	132	116	97	---	---	---	---	68
0---------	3142	64	136	128	119	101	100	83	---	---	---	75
	3145	57	111	105	102	75	65	---	---	---	---	66
	3444	59	145	126	97	90	---	---	---	---	---	58
	3445	57	124	101	90	84	---	---	---	---	---	60
	3448	52	110	105	89	85	69	---	---	---	---	70
	3450	44	102	94	84	67	66	---	---	---	---	64
Average -	----	---	---	---	---	---	---	---	---	---	---	66.[illegible]
	3125	61	134	112	100	86	84	---	---	---	---	64
Average, 1.[illegible] (20 per cent of diet)----	3127	59	122	110	107	86	72	---	---	---	---	70
	3130	56	114	105	92	78	74	---	---	---	---	67
	3132	47	106	96	82	63	---	---	---	---	---	59
	3144	60	130	119	96	95	84	76	---	---	---	73
	3143	54	111	107	94	74	---	---	---	---	---	62
	3146	57	117	110	92	---	85	70	---	---	---	76
	3446	55	120	80	---	---	---	---	---	---	---	49
	3447	52	114	95	86	---	---	---	---	---	---	53
	3449	52	103	100	85	79	65	---	---	---	---	67
Average -	----	---	---	---	---	---	---	---	---	---	---	64.[illegible]

Table 2.—Weight records of guinea-pigs fed honeycomb as the sole source of vitamin B

WHITE-CLOVER HONEY (NO. 1)

Quantity of honey fed per rat per day, 6 days per week (grams)	Rat No.	Weight of rats at age of 4 weeks	1	2	3	4	5	6	7	8	Period of survival
		Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Grams	Days
	988	46	38	37	34	25	---	---	---	---	28
0	1142	44	40	40	37	37	34	29	26	---	45
	1304	50	51	49	44	39	33	---	---	---	35
	1308	50	50	52	45	35	33	---	---	---	30
Average	---	---	---	---	---	---	---	---	---	---	34.5
	985	51	49	46	39	32	---	---	---	---	28
	987	48	46	45	37	30	---	---	---	---	28
	1137	47	41	44	41	38	33	30	27	---	46
1.0	1143	37	32	35	31	28	25	24	---	---	36
	1305	45	49	41	37	30	28	---	---	---	34
	1307	48	46	50	47	37	34	---	---	---	35
	1397	51	52	51	45	40	36	31	---	---	42
	1400	50	45	47	42	37	33	28	---	---	40
Average	---	---	---	---	---	---	---	---	---	---	36.1
	986	45	44	45	37	30	---	---	---	---	25
	989	44	41	39	33	27	---	---	---	---	28
	1138	47	41	40	37	34	30	26	25	---	46
2.0	1139	42	37	35	33	29	25	23	---	---	36
	1303	50	51	48	40	39	32	---	---	---	35
	1306	50	54	48	41	35	30	---	---	---	34
	1399	49	44	46	40	36	32	30	---	---	36
	1401	50	47	47	40	35	31	28	---	---	37
Average	---	---	---	---	---	---	---	---	---	---	34.6

BUCKWHEAT HONEY (NO. 2)

	1961	45	41	41	36	30	26	---	---	---	34
	1968	41	40	36	31	25	---	---	---	---	26
0	1972	41	39	37	33	27	---	---	---	---	28
	1985	35	34	31	27	25	---	---	---	---	24
	1989	32	32	29	26	21	19	---	---	---	30
Average	----	---	---	---	---	---	---	---	---	---	28.4
	1962	44	41	42	38	33	27	26	---	---	38
	1963	42	41	38	35	31	25	---	---	---	34
	1964	48	45	44	41	35	29	27	---	---	38
	1965	46	41	37	35	31	28	28	---	---	39
	1966	45	40	39	35	30	26	---	---	---	33
	1967	42	40	38	35	27	25	---	---	---	31
	1969	32	30	28	27	23	20	---	---	---	35
	1970	44	39	37	33	25	22	---	---	---	32
Average, 0.7 (30 per cent of diet)	1971	44	41	39	35	29	24	24	---	---	36
	1973	41	38	36	33	29	25	25	---	---	36
	1974	39	38	34	31	26	22	---	---	---	33
	1984	35	30	31	27	23	21	---	---	---	30
	1986	34	33	34	30	25	21	---	---	---	30
	1987	33	30	30	27	21	---	---	---	---	28
	1988	32	32	30	28	24	23	---	---	---	32
	1990	37	35	32	29	28	23	---	---	---	35
	1991	35	31	31	27	23	21	---	---	---	31
	1992	34	31	32	29	24	21	---	---	---	30
Total	----	---	---	---	---	---	---	---	---	---	33.[illegible]

LIGHT COLORED WHITE-CLOVER HONEY (NO. 3)

	3010	49	49	45	41	34	30	---	---	---	31
	3014	45	46	43	38	32	27	---	---	---	31
	3015	45	45	42	36	31	29	---	---	---	30
0	3072	52	50	48	40	36	32	---	---	---	32
	3075	52	48	44	43	38	33	28	---	---	38
	3079	45	41	38	38	30	29	---	---	---	29
	3081	45	41	37	36	30	26	---	---	---	31
Average	----	---	---	---	---	---	---	---	---	---	31.7
	3009	50	52	49	44	38	33	---	---	---	31
	3011	48	50	49	41	34	33	---	---	---	30
	3012	47	47	45	40	33	30	---	---	---	30
	3013	49	50	47	42	35	31	---	---	---	30
Average, 0.9 (30 per cent of diet).	3016	45	47	44	40	32	30	---	---	---	30
	3071	55	56	51	46	39	36	---	---	---	35
	3073	52	52	50	44	38	35	---	---	---	31
	3074	53	49	49	43	35	32	---	---	---	30
	3077	48	46	44	42	38	33	---	---	---	31
	3078	48	43	42	38	33	29	---	---	---	31
	3080	45	40	39	34	31	27	---	---	---	31
Total	----	---	---	---	---	---	---	---	---	---	30.9

HONEYCOMB

	3173	50	48	45	39	34	31	29	---	---	40
	3174	50	48	45	38	33	29	---	---	---	34
	3175	47	43	42	35	32	28	---	---	---	34
Average, 0.5 (20 per cent of diet)	3176	45	44	41	36	30	28	---	---	---	33
	3177	48	45	42	35	31	28	---	---	---	33
	3178	47	45	41	34	31	---	---	---	---	27
	3179	46	44	39	34	31	---	---	---	---	28
Average	----	---	---	---	---	---	---	---	---	---	32.7

sults from the groups of test animals are presented in Figure 1, A and C.

Few of the rats receiving the honey or honeycomb lived out the full eight weeks of the test period, though they lived on a weighted average longer than the control rats. The average period of survival of the rats fed no honey was 77.7, 60.9, and 66.0 days respectively. The average period of survival of the rats fed 2 gm. of honey per rat per day, six days per week was 77.4 days in the case of white-clover honey No. 1, 60.9 days in the case of light-colored white-clover honey No. 2, 65.2 days in the case of buckwheat honey No. 2, and 64 days when the honeycomb itself was fed. When white-clover honey No. 1 and buckwheat No. 2 were fed in larger quantities, or to the extent of 3 gm. per rat per day, six days in the week, the average survival period of the animals proved to be greater not only than that of the control animals but also of those fed only 2 gm. of honey per rat per day. While the feeding of light-colored white-clover honey No. 2 increased the survival period of the test animals this was not the case when the honeycomb was fed. In all cases the rats fed honey and honeycomb exhibited as severe pathological lesions as those that received no honey in addition to the basal diet.

These results indicate that no one of these three samples of honey contained an amount of vitamin A that could be detected by the method used for measuring this factor. The honeycomb, of course, contained vitamin A in considerable quantity.

The determination of the vitamin B content of the three samples of honey was completed before the multiple nature of vitamin B had been generally recognized. The method used was that of Sherman and Spohn, which makes no distinction between the two vitamin B factors. All rats were kept in cages having raised screen bottoms and were given a basal diet of casein (purified) 18 per cent, starch 68 per cent, butterfat 8 per cent, cod liver oil 2 per

Table 5.--Weight records and autopsy findings of guinea pigs receiving honey as the sole source of vitamin C

Guinea pig No.	Honey fed per 300 gm. of initial guinea pig weight	Weight of rat			Duration of experiment	Type of scurvy symptoms of autopsy	Autopsy findings[a]								Total of autopsy findings
							Bony system				Hemorrhages				
		Beginning	Maximum	Final			Jaw	Teeth	Ribs	Joints	Ribs	Intestines	Joints	Muscle	
	Grams	Grams	Grams	Grams	Days										
NO HONEY															
B 5	0	300	306	191	26	Severe	+++	+++	+++	+++	+++	++	+++	++	22
B 20	0	304	339	164	26	Very severe	+++	+++	+++	+++	+++	+++	+++	+++	24
B 40	0	344	350	184	23	Severe	+++	+++	+++	-	+++	+++	+++	++	20
Average					25.0										22
WHITE-CLOVER HONEY (NO. 1)															
B 11	1.52	310	310	227	20	Mild	++	++	++	++	-	+	Trace	Trace	9
B 37	2.78	347	359	196	28	Moderate	+++	+++	+++	+	Trace	+	+	do	12
B [illegible]	2.86	378	397	244	27	Mild	+	+	+++	+	-	+++	++	+	12
B [illegible]	2.90	350	390	249	31	Severe	++	+++	+++	++	++	++	++	+	17
B [illegible]	3.15	340	352	194	26	-do	+++	+++	+++	++	+	+++	+++	++	20
B [illegible]	3.28	402	406	206	27	Moderate	+	+++	+++	+	-	++	++	++	14
B 26	3.39	353	365	192	24	-do	++	++	+++	+	+	++	+++	++	16
B 7	3.40	314	380	214	37	-do	+	++	+	[illegible]	Trace	++	+++	++	13
B [illegible]	3.52	299	308	195	24	Severe	+++	+++	+	+	+++	Trace	Trace	Trace	11
B 14	3.67	321	373	233	28	-do	+++	+	++	++	++	do	+++	+++	16
B [illegible]	3.70	296	311	164	26	-do	+++	+++	+++	++	+	+++	+	+++	19
B 1	3.82	306	353	201	35	-do	+	++	+++	+	Trace	+++	+	+	12
Average					27.7										14.3
BUCKWHEAT HONEY (NO. 2)															
70	.74	414	428	252	29	Moderate	++	+++	++	+	-	+	++	+	12
71	.99	420	420	224	25	Severe	+++	+++	++	-	++	+++	++	++	17
67	1.04	419	420	298	21	Moderate	+	+	+++	+	++	+++	++	+	14
68	1.09	419	429	229	35	Mild	+++	+++	Trace	Trace	-	+	+	+	9
69	1.16	427	466	238	35	Severe	+++	+++	+++	+	++	++	++	+	17
64	1.20	413	443	243	32	- do	+++	+++	+++	+	++	+	++	+	16
63	1.63	413	413	249	21	Positive	++	++	+++	Trace	+++	+++	++	+	16
Average					28.3										14.4
LIGHT-COLORED WHITE-CLOVER HONEY															
75	.81	442	464	263	36	Severe	++	+++	+++	++	+	+++	++	++	18
73	.84	443	472	245	33	-do	++	+++	+++	++	++	+++	++	++	19
76	1.20	453	461	291	29	-do	+	+	+++	+	+++	++	+++	+++	17
74	1.42	437	453	261	25	-do	+	++	+++	+	++	++	++	++	15
Average					30.8										17.3

[a] Intensity of scurvy symptoms is indicated by plus signs each having an arbitrary value of 1; minus signs indicate absence of symptoms

cent, Osborne and Mendel salts 4 per cent. Honey No. 1 was fed in amounts of 1, 2, and 3 gm. per rat per day. The other two samples were incorporated in the basal diet and replaced 40 per cent of the starch in the diet; the honeycomb replaced 20 per cent. The test period is usually eight weeks, but all of the animals used for these tests died before the end of the eighth week. The results are shown in Figure 3 and Table 3.

Only one of the honey samples and the honeycomb enabled the rats to live any longer or to make any greater gains in weight than the rats that received no additions to the basal diet. These results show that the honeys and honeycomb examined contained no vitamin B. This, of course, does not take into consideration the fact that vitamin B was subsequently found to be a complex.

The method for testing for vitamin D is identical with that described in a previous paper. Young rats approximately 60 grams in weight were placed on the Steenbock low phosphorus diet consisting of yellow corn, 76 per cent; wheat gluten, 20 per cent; calcium carbonate, 3 per cent; and sodium chloride, 1 per cent, fo
1 per cent, for 21 days, at which time they showed evidences of a rachitic condition. The honey was then fed during a test period of not less than 6 nor more than 15 days. At the end of the test period a line test was made according to the method described by McCollum. While this method may not be entirely satisfactory for quantitatively measuring vitamin D it seemed to us to be preferable to any other method worked out to date.

The three honeys tested were incorporated in the basal diet to the amount of 30 per cent, 10 per cent, and 20 per cent, respectively, and the honeycomb as 10 per cent. In each litter of rats used for testing honey No. 1 there was one or more control rats which were given 0.5 per cent cod-liver oil during the test period instead of honey. This plan of having positive

Table 4. Summary of tests made to determine the vitamin D content of honey and honeycomb as compared with a cod-liver oil supplement

Test food in the diet	Duration of test period	Number of cases of rats	Average intake of honey per 100 gm. of rat per day	Average value of line test
WHITE-CLOVER HONEY (NO. 1)				
	Days		Grams	
0	0	11	---	0
	11	5	---	0
	13	6	---	0
	15	1	---	0
30.0	11	13	2.36	0
	12	2	1.98	0
	13	13	2.39	0
	15	1	2.49	0
COD-LIVER OIL				
0.5	9	15	0.04	4
	11	2	.04	4
BUCKWHEAT HONEY (NO. 2)				
0	0	4	---	0
	13	2	---	0
	15	4	---	0
10.0	11	2	0.70	0
	13	3	.67	0
	15	3	.70	0
20.0	13	2	1.45	0
	15	2	1.42	0
LIGHT-COLORED WHITE-CLOVER HONEY (NO.3)				
0	0	3	---	0
	15	3	---	0
[illegible]	13	12	1.49	0
	15	12	1.50	0
HONEYCOMB				
0	0	1	---	0
	13	1	---	0
10.0	9	3	0.80	0
	13	3	.79	

controls was not considered necessary in the tests with the other samples.

Summaries of the results of these tests are given in Tables 4 and 5. As all of the line tests with the honeys and the honeycomb were negative, the results with individual rats are not given. X-ray photographs were also made of the rats used in these determinations. These pictures as shown herewith check the line tests made on the corresponding rats in that all showed severe rickets. From these results it would seem that none of the honeys examined nor the honeycomb contained any amount of vitamin D that would cause calcium deposition in rats which had been maintained for 21 days on the Steenbock low-phosphorus-yellow-corn diet.

Dutcher determined the vitamin B content of honey obtained while basswood and white clover were in full bloom, using pigeons in his work. The tests were made by absorbing the citamin of the honey on Lloyd's reagent and feeding amounts equivalent to 45 gm. of honey. Nectar was tested in the same manner. Dutcher concluded that the strained honey contained a negligible amount of vitamin B and that there was little evidence of its presence in nectar.

In 1919 Bachman found that 25 c.c. of a strained honey added to 75 c.c. of water and used in Nagel's solution did not furnish the vitamin necessary for the growth of yeast.

Faber in 1920 made a study of the antiscorbutic value of a white-sage comb honey which was extracted before using. Guinea pigs used, and all of them exhibited characteristic scruvey symptoms when fed a solution of 1 part of honey to 15 parts of water, which was later increased to 1 part of honey to 5 parts of water. The quantity of honey consumed ranged from 0.88 to 5.58 c.c. of honey per 100 gm. of initial body weight. Faber concluded that it was "probable" that honey contained no antiscorbutic vitamin.

Hawk, Smith, and Bergeim determined the vitamin A, B, and C content of blended honey, white-clover honey, and honeycomb. For vitamin B their method consisted in feeding three groups of rats, respectively, (1) a diet free from vitamin B; (2) one in which blended honey replaced part of the starch; and (3) one in which white-clover honey replaced part of the starch. At the end of four weeks the diets were changed. Group 1 was divided and half the rats were given blended honey and the other half white-clover honey. After another two weeks all were given milk. From the results obtained, Hawk and his associates concluded that there was a small amount of vitamin B present in these honeys. Following a similar procedure for the vitamin A determination, they found that strained honey contained no vitamin A, whereas a definite but minimal amount was present in the comb honey. For the vitamin C test they fed three groups of guinea pigs in the same way; that is, they gave one group the scorbutic diet, a second group the same diet with blended honey to replace a part of the starch, and a third group the same diet with clover honey to replace the starch. All developed scurvy within two weeks, showing that the honeys contained no vitamin C.

In 1922 Luttinger gave a general report of his findings on the use of honey in infant feeding in which he states that he found vitamins A, B, C present in 82 per cent of the honey examined. No experimental evidence was presented to bear out this statement.

Smith in 1927 found vitamins A and B in corn syrup and C in maple sugar

Scheunert, Schieblich, and Schwanebeck, in 1923, examined three samples of honey for vitamins A, B, C, and concluded that none of the samples containe vitamins.

Cathcart in 1929, reported that white clover honey could reasonably be expected to replace cereals in the diet of children.

Caillas, in 1925, reported work done with pigeons which seemed to show that fresh honey contained vitamin B. The number of birds used, however, was too small to make the results very convincing.

The method used to determine the vitamin C content of honey was that described by Sherman, LaMer, and Campbell. No tests were made on the honeycomb The basal diet described by Sherman consisted of skim-milk powder heated at 510° C. for 4 hours, 30 per cent; a mixture of equal parts commercial rolled oats and wheat bran, 59 per cent; butterfat, 10 per cent; table salt, 1 per cent. The guinea pigs were somewhat heavier at the beginning of the test period than the standard animal described by Sherman, which was usually lighter in weight. Some difficulty had been experienced in other work in getting the smaller guinea pigs to eat the basal diet satisfactorily. In these tests the preliminary period was continued until it was ascertained beyond a doubt that the guinea pigs would eat the basal diet.

The honey was fed apart from the basal diet, and the test period was continued in each case until the guinea pig passed away. Honey is not relished by guinea pigs, no more than is spinach by most children, and the feeding required a great deal of time and patience.

The intake of honey was calculated as grams per day per 300 gm. of initial body weight. Table 3 gives the results of the feeding tests. For purposes of comparison each plus (-) under autopsy findings has been given a value of 1 and these have been totaled for each animal, i. e. for each guinea pig.

On an average the guinea pigs that had the honey did not live appreciably longer than those that had none. Before death and at autopsy all showed symptoms of scurvy that were as severe as the symptoms shown by the control animals. It is evident from these results that the three samples of

honey examined contained no appreciable amounts of vitamin C.

The three samples of honey examined were produced in widely separated localities and represented extremes of color variation. No detectable amounts of vitamins A, B, C, or D were found in any of the honeys or in the honeycomb.

It appears doubtful that honey would prove a good source of vitamin E. The authors plan later to undertake an investigation on the growth-promoting properties of honey as related to its iron, calcium and magnesium contents.

The pathological lesions found after death at autopsy of the rats fed honey and honeycomb as a sole source of vitamin A were very severe, and in some cases simulated those usually associated with vitamin E deficiency. The prevalence of black tongue in dogs and of pellagra in certain southern communities assumes added importance by reason of this finding. It was also observed that the guinea pigs fed honey as a sole source of vitamin C quickly contracted scurvy, showing symptoms of this disease at autopsy. It is interesting in this connection to remember that the juice of lemons and of limes was used more than a century ago to combat this dreadfully devastating disease among sailors. For this reason British sailors are still often called lime juicers, limeys, or limers.

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THE PREPARATION OF SCIENTIFIC PAPERS

General

In the preparation of a scientific paper the first consideration should be given to the readers to whom the paper is directed. Obviously the treatment of a subject in a journal, read almost exclusively by teachers and investigators, requires the use of terms and forms of expression different from those suitable in a trade journal.

In writing scientific papers that are to be published in scientific journals there are practically no limits to the range of choice of technical words that may be used. However, technical words should be used not merely because they are scientific, but because they express ideas more clearly and more adequately than do simpler words.

On the other hand, in writing for a trade paper the author should not forget that many of the expressions which have become part of the everyday vocabulary of the laboratory worker are unintelligible to the layman. Words and expressions of a descriptive nature should therefore be used to as great an extent as possible. Also, in the choice of methods of presentation of data only those charts, figures, and mathematical formulas should be used that are elementary in their manner of portrayal of relationships.

Clarity of expression is essential in presenting scientific subjects. To write clearly one must first have clearly in mind what is to be said,- that is, a mental outline. Though many people write without first preparing a written outline, it is doubtful if any writer obtains pleasing results without a form of presentation at least clearly in mind. While a mental outline may be a sufficient guide in the preparation of a short paper, in the presentation of extensive studies a written outline should be prepared, at least for the purpose of serving as a means of fixing firmly in the author's mind the order and scope of the presentation.

The first step in preparing an outline should be the incorporation into tables and graphs of all the data to be presented. The arrangement of these in the order logical for presentation constitutes an adequate basis for the paper.

Style includes both the personal manner of writing, which, obviously, cannot be taught, and the conventions adopted by writers or prescribed by editors for the sake of uniformity. Each writer establishes his personal style, but no style is satisfactory unless the use of it results in a clear and concise presentation of results. Writing should be plain, simple, and direct. These characteristics can be obtained most easily if the author writes what he thinks the reader wants to know rather than what he is anxious to tell.

As a general rule, it is not considered good form to use the first person, especially the singular, in scientific writing. The first person plural is used infrequently in stating an opinion on a controversial point or to avoid the use of the expression "the present authors."

Only a few of the more common objectionable usages and constructions can be discussed here. The use of such words as "very", "marked", "great", "quite", etc., convey only meager information and should be replaced, whenever possible, by words of specific meaning or by words giving actual measurements of magnitude or intensity. When comparative adjectives, such as "higher", "stronger", etc., are used, the author should make certain that the comparison is completed, even though the meaning may be evident.

Ex. "Greater lability of the sulfur of milk exposed to radiation also appears to be good evidence of the possible role of sulfur compounds in formation of the activated flavor." (Greater than what?)

Trite combinations of words are tiresome to the reader, are not usually explicit and should be avoided whenever possible.

Ex. "There was no significant difference in the time required--".

"Recent work in this laboratory made it desirable to develop a practical method for the determination of nitrogen in small amounts".

"This investigation was undertaken to determine the desirability--".

Repetition of ideas is also tiresome to the reader and, though often used in oral presentations for the sake of emphasis, is not necessary in scientific writing.

The use of one noun as the object of several prepositions is often useful to prevent a "choppy" construction.

Ex. "He will cooperate with and be assisted by ---".

The use of this type of construction should be avoided, however, when it creates an involved or impressive-sounding sentence.

Ex. "A public official should be approached from, approachable by, and acceptable to his community."

The reader of this sentence probably forgets the first verb and preposition by the time he has come to the object and then has to reread the sentence in order to comprehend the whole of it.

The proper use of pronouns serves to make a sentence smooth. The danger in their use is that of a confused meaning when their relationship to their antecedent is not clear. This danger can usually be avoided by placing the pronoun and the clause it introduces as near the antecedent as possible---preferably immediately after the antecedent.

Ex. "The figures obtained in these experiments, which are not of the greatest possible accuracy, are given to show that---."

"The figures, which are not of the greatest possible accuracy, were obtained in these experiments and are given to show that ---."

Ex. "Skim milk and whey are by-products of dairy manufacturing processes for which wider use in human foods has been sought."

"Skim milk and whey, for which wider use in human foods has been sought, are by-products of dairy manufacturing processes."

If the noun to which the pronoun refers is not clearly indicated, the antecedent should be repeated.

At times the use of a participle to introduce a qualifying phrase which is explanatory in nature is advantageous. It promotes brevity and smoothness of construction. However, as in the case of the use of pronouns, the participle should not be too far removed from the noun or pronoun to which it relates, but should appear immediately before or after it.

Ex. The results were used in the latter calculations, indicating the reactivity of the compound.

The results, indicating the reactivity of the compound, were used in the latter calculations.

At times the noun or pronoun, the action of which is named by the participle, is missing. Then the participle is said to be "dangling."

Ex. "Introducing this variation in the procedure, the results appeared consistent - - -."

The general rule for punctuation when participial phrases are used is as follows: Nonrestrictive phrases are set off with commas, while the restrictive phrases are not. This rule applies also when relative clauses are used.

Ex. (Nonrestrictive). "Washington, now containing 500,000 inhabitants, will double in size in the next 50 years." "Washington, which now contains 500,000 inhabitants, will - - - -."

(Restrictive) "A city having a good harbor grows rapidly."
"A city that has a good harbor grows rapidly."

Use of the appositive is another method of saving words and promoting smoothness of construction.

Ex. "The color was obtained with use of the biuret test -- the test usually employed to determine the presence of proteins."

The tendency on the part of some writers to hasten the qualification of the action expressed often results in the use of split infinitives.

Ex.- "To adequately explain the results ---."

"To explain adequately the results ---" or "To explain the results adequately ---"

In general, expression of the action should precede its qualification. In no case should the infinitive be split.

The prime function of punctuating marks is to aid in the understanding of the sentence. If after proper punctuation the meaning of the sentence is obscure, the sentence should be recast, or perhaps, be divided into two or more sentences.

A word is used correctly only when its exact meaning is known. The correct usage of a word can be ascertained only by use of "that humble camel, the dictionary." Some of the words the meanings of which are frequently confused are: effect and affect; variation and difference; quantity and amount; infer and imply; precision and accuracy; fine and nice; and due to and because of. Many more suggestions concerning details might be made, but a sufficient number has been given to illustrate the types of faults most frequently encountered.

Revision is often considered to be the most important task in the production of a pleasing paper. Some of the items to be considered in a revision are: (1) style, (2) length, (3) repetition, (4) accuracy, (5) consistency, (6) plausibility, (7) clearness, (8) sentence structure, (9) euphony, (10) connectives, (11) punctuation. It is easier to consider only one or two of these items at one reading of a paper than to consider all of them together.

The methods of revision employed by Anatole France have been described as follows: "In the first revision he enlivened what had been platitudinous. The second was for 'weeding out the dandelions,' whos, whiches, and whoms. In the third he eliminated the semicolons, shortened the sentences, and struck out phrases which merely linked one sentence with another or marked a transition from one thought to another. In the fourth draft, he gave special attention to the order of sentences and to the repetition of the same word; he looked on the recurrence as a warning to rewrite the sentence, not to search for a synonym. The fifth draft saw the disappearance of adjectives. In the sixth draft, he chipped away what he called the pastry, all that was adventitious and redundant, and over the seventh draft he passed the plane, for, he said, "a good

writer is like a good cabinet maker - he planes his phrases smooth." Most of his methods are applicable to the writing of articles on science.

The editorial committee of the laboratory was established to aid the members of the staff in the proper presentation of their data. This does not relieve the writer of responsibility for the preparation of his paper, and when it is presented for editing it should not be a rough draft, but should be in proper form for publication.

Specific Suggestions

A properly prepared paper on a scientific topic includes: (1) title, (2) authors and organization in which the work was done, (3) introduction, including a discussion of the significant literature and a statement of the object of the research, (4) materials and methods, (5) experiments and results, (6) discussion of results and conclusions, and (7) bibliography.

(1) Title: The title should be concise and should indicate as definitely as possible the subject matter of the paper. Indefinite and generalized titles should be avoided. A title like "Feeding Experiments with Steers" is defective in that it fails to tell the reader what he may expect to find in the paper. This title should be made specific by telling the exact nature of the experiments, as, for instance, "The Relation of a High Protein Ration to the Growth of Steers."

If it is difficult to write a short, comprehensive title, the author should consider whether or not he is trying to put two or more papers under one title. If this is so and he divides the paper into two shorter ones, he will find it easier to write the papers, and, incidentally, will have less difficulty in getting prompt acceptance by editors.

Sub-titles should be used only when there is a good reason for connecting a number of papers in a series. This should be done only when the papers in the series are really parts of a specific subject and each paper has a definite relationship to the others.

(2) Source of work and paper: The proper designation of the source of papers from this laboratory is the authors' names followed by the words Division of Dairy Research Laboratories, Bureau of Dairy Industry, United States Department of Agriculture.

(3) Introduction: The introduction should be a brief statement of the problem investigated with some review of previous investigations which have direct bearing on the subject. It should give the reader a clear idea of the problem.

On account of the limitations on space in the journals, it is inadvisable to attempt to discuss the literature completely or in detail. The discussion should be general in its nature, and references to papers which have a direct bearing on some particular phase of the work should be cited at the appropriate place in the discussion of the experimental work.

(4) Materials and methods used: The reader should be given sufficient information concerning the methods employed to enable him to repeat the work if he desires. However, the author should remember that the description of methods is only incidental and should not allow it to become a major part of the paper. Detailed discussion should be limited to methods which are new and have special application to the problem. The reader should be referred to the original publications for methods which have already been described adequately.

Reference to commercial products by name of source is not usually permitted, but is sometimes necessary in order to designate a particular quality or grade, as "Difco peptone", or "Baker's sodium phosphate".

(5) Experiments and results: Arrangement of data should be given careful consideration. A chronological order should be used only when the time element is important, as, for instance, when seasonal variations are stressed. When the nature of data will permit, the results should be arranged so that the most conclusive evidence is last. In other words, the reader should be left with the most convincing evidence fresh in his mind.

No absolute rule can be given for the choice between tables and graphs, but, in general, tables should be used when it is desirable to present results with exactness and detail, while graphs are indicated when they present the data in a more obvious or striking form than do tables and particularly when trends are to be shown or when it is desirable to show how two variables are related. It is rarely necessary to present data in both tables and graphs.

Chapter I of Fundamentals of Dairy Science contains examples of the acceptable forms of tables. However, the table on page 48 is poorly constructed. In its present form the designation of "percentage" occurs under the names of authors instead of under the names of the elements. The positions of the names of the authors and those of the elements should, therefore, be interchanged and the data rearranged accordingly.

A table should be so complete in itself that it will be understood by the reader without reference to footnotes or explanations in the test. It should not be necessary to restate in the text the data already given in a table. The title of a table should be a concise statement of the subject matter shown and may, if necessary, include mention of some of the factors common to all of the data.

A table should be confined, if possible, to the exposition of a single point, and in any case should be as simple as the data will permit. After a table is made up, it should be studied carefully to see if there

is any material which could be eliminated without impairing the clearness or validity of the statement. The left-hand column should contain the factor varied. In some cases it may be necessary to use numbers or letters to indicate an experiment or combination of factors, but this should not be done when it is possible to describe the experiment or factors in a short expression. Columns which are to be compared should be adjacent, not separated by columns of modifying or descriptive material.

Vertical columns should contain like data; that is, in terms of the same unit, and should have in the box with the data the name of the unit of the column, as per cent, grams, pH, etc.

In constructing a table some consideration should be given to the size and shape of the page on which it will be printed. The table should not be so constructed that it is too wide for the page, therefore requiring use of small type or printing vertically on the page.

A writer should not crowd a large sheet--e.g., 10 x 18 inches--with data and "let the editor worry." A large quantity of concordant data leading to one set of conclusions is no more convincing than a few averages of data accompanied by a statement as to how many observations were included in the average. However, when the degree of variability is important to the purpose of the paper, averages should not be used, and the limits of variations should be stated.

See Fundamentals of Dairy Science, pages 124, 147, and 335, for examples of data properly presented in graphical form.

The size and proportions of a graph should be adjusted to the page on which it is to be printed so that the reduction will be as little as possible.

Graphs should be designed so that the proportional accuracy along the abscissa is practically the same as that along the ordinate. By convention, the independent variable is plotted horizontally, with values increasing toward the right and the values of the dependent variable increase upward.

The author should remember that in reproduction a graph will be reduced and, hence, if it contains too many points or lines, they will become confused.

Though it is convenient to make the original on cross section paper, for reproduction the graph should be copied on tracing cloth or white paper with the cross lines limited to those required to estimate the values of the dependent variable.

The lines and letters should be made in India ink and sufficiently heavy to be distinct when reduced. The letters should be of such size that, when reduced in reproduction, they will be of not less than 2 mm. height.

When the size of the graph permits their use, typed letters appear neater than free-hand letters. The blackness and sharpness of a letter can be increased by putting carbon paper behind the drawing so that the letter is typed on both sides of the paper. A similar effect may be obtained by removing the ribbon from the typewriter and putting carbon paper in front of, and facing, the drawing.

The legend, or title, and number of the graph should not be lettered on the graph, but, since this is to be set in type, it should be on a separate, attached sheet. This applies also to titles and numbers of photographs and line drawings.

It is sometimes desirable to use a graphic system of rectangular blocks of different heights in presenting data. A comparison of values depending on two or more variables is conveniently and effectively presented in this way. For an example, see Fundamentals of Dairy Science, page 535.

Textual matter describing experiments and results should not repeat information given in tables and graphs. It should mention modifications of the general methods used and should point out results that are not given in the tables or graphs or that are striking or important. If, in composing this part of a paper, adequate and complete results cannot be stated, more experiments should be carried out before attempting to finish the paper.

(6) Discussion and conclusions: The section devoted to discussion should be used to interpret to the reader the data that have been presented and to express the author's views on the significance of the results. Since it is usually advisable to discuss in some detail the data as presented in the tables and graphs, this discussion will be in the nature of a recapitulation, but the repetition of data or of discussion should be avoided.

In the matter of tenses, experimental facts should be stated in the past,

Ex. "Media were heated".

presentation of tables and graphs in the present,

Ex. "Table 2 shows ---".

discussion in the past or present, depending on whether the facts or their presentation are involved,

Ex. "Although the organisms grew well at 30° C., it is probable that the optimum temperature for this species is somewhat higher".

specific conclusions in the past,

Ex. "A hitherto unknown compound was produced as a byproduct of this reaction".

and general truths in the present.

Ex. "The optimum temperature for this species is 31° C."

"Several byproducts are formed when this reaction takes place".

Conclusions may be a part of the discussion but, for emphasis, are frequently placed last and under a separate heading.

(7) Summary: Industrial and Engineering Chemistry requires a summary to precede the article. The Journal of Bacteriology requires an abstract for publication in Biological Abstracts, and The Journal of Dairy Science an abstract for the abstract section of the Journal. In papers for other journals a brief abstract of the results may be made a part of the section of conclusions.

(8) Bibliography: In preparing the bibliography the requirements of the journal in which the paper is to be published must be considered. For example, the Journal of Agricultural Research and other departmental publications require that if the paper contains less than 7 references they be cited as foot notes on the pages on which they occur. If there are 7 or more references they are to be arranged at the end of the paper alphabetically by authors, with the papers by the same author listed chronologically. The citations are numbered consecutively as they appear in the bibliography. The full title must be given, as:

(2) Aamodt, O. S.
1927. Breeding wheat for resistance to physiologic forms of stem rust. Jour. Amer. Soc. Agron. 19: 206-218.

The Journal of the American Chemical Society requires citations to be run in the text immediately following the line in which the citation appears with ruled lines above and below. They should be numbered consecutively as they appear in the text and if a citation appears more than once it should in each case be given the number of the first citation. The citation should be as brief as possible and abbreviations listed in Chemical Abstracts should be used. The usual form is:

(3) Shaw, R. H., J. Ind. Eng. Chem. 12, 1168 (1920).

but in a citation to a book:

(4) Sutermeister, E., "Casein and Its Industrial Applications," p.275, Chemical Catalog Co., 1927.

Industrial and Engineering Chemistry requires references to be arranged alphabetically by authors and to be numbered in that order. The form of citation is the same as that of the Journal of the American Chemical Society.

The Journal of Dairy Science requires the bibliography arranged alphabetically by authors at the end of the paper. Citations are numbered consecutively as they appear in the bibliography. The title is given in full and the usual form is:

(9) Rice, Frank E. and Markley, Alton L. The relation of natural acidity in milk to composition and physical properties. J. Dairy Sci., 7:5, 468-483. 1924.

The Journal of Bacteriology places the bibliography at the end of the paper with the citations arranged alphabetically by authors. The reference in the text is by name and year, and in case of more than one reference in one year the years are marked a, b, etc.

The approved form is:

Thorne, D. W., and Walker, R. H. 1936a. Physiological studies on Rhizobium. VI. Accessory factors. Soil Sci. 42, 231-240.